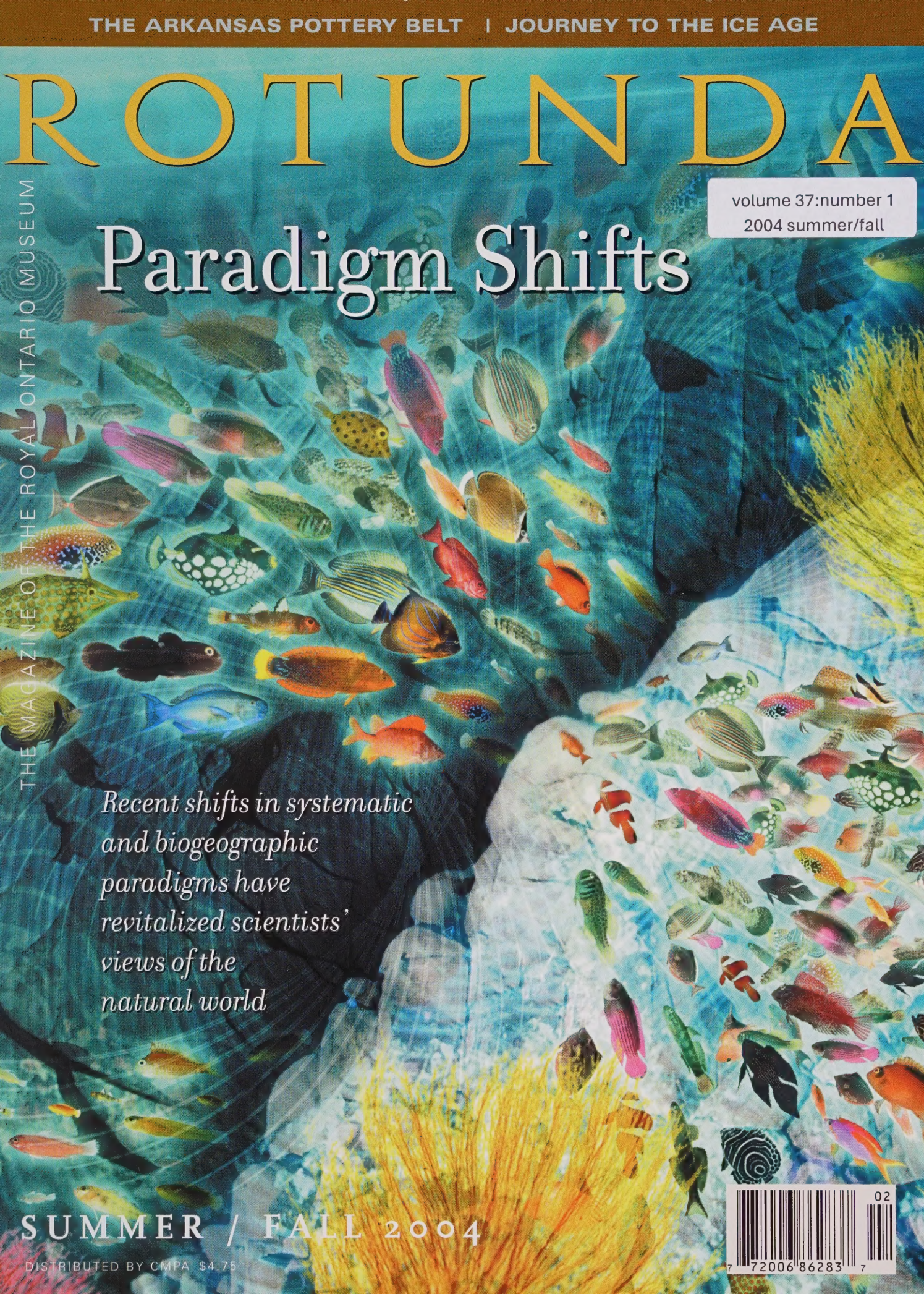
THE ARKANSAS POTTERY BELT | JOURNEY TO THE ICE AGE

ROTUNDA

THE MAGAZINE OF THE ROYAL ONTARIO MUSEUM

volume 37:number 1
2004 summer/fall

Paradigm Shifts



Recent shifts in systematic and biogeographic paradigms have revitalized scientists' views of the natural world

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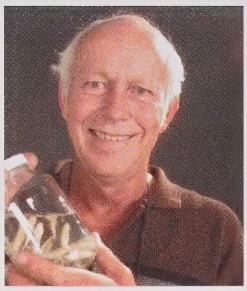
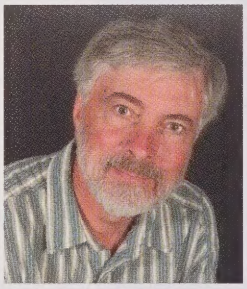


Dr. Rick Winterbottom
ROM Natural History

RICK ("Paradigm Shifts") was born in Zambia and grew up in South Africa. He obtained a first-class B.Sc. (Hons) from the University of Cape Town in 1967 and earned a Ph.D. in Biology from Queen's University in 1971. Postdoctoral studies followed at the Smithsonian Institution and the National Museum of Canada. He then spent three years at the Smith Institute of Ichthyology in South Africa, where he conducted numerous expeditions to collect marine fishes. He joined the ROM in 1978, and has since participated in or organized about 20 similar expeditions throughout the Indo-Pacific (most recently in Palau). His research interests range from systematics through biogeography and macro-evolution, and he has published some 80 scientific monographs and papers on a wide variety of fish groups. Current research emphasizes biogeography of the Indo-Pacific marine biota, and the systematics and relationships of gobioid fishes (of which there are about 3000 species worldwide).

Dr. Mima Kapches
ROM World Culture

MIMA ("Tales from the Arkansas Pottery Belt") is a senior curator in the Anthropology section. She is an Ontario archaeologist specializing in the archaeology of the Greater Toronto Area.



Dr. Peter Storck
ROM Natural History

PETER ("Journey to the Ice Age") is a senior curator emeritus in the Palaeobiology section of ROM Natural History. After earning a Ph.D. from the University of Wisconsin he joined the ROM as an archaeologist in 1969 (starting as assistant curator). His research and fieldwork concerns the Early Paleo-Indians who migrated to southern Ontario around 11,000 years ago, shortly after the retreat of the continental ice sheet. He has published several monographs and more than 60 scholarly papers and popular articles. *Journey to the Ice Age* is his first book for the general public. Although Peter took early retirement in 1995, he continues to be engaged in research and writing up the results of earlier projects, and he is giving thought to writing another book for the general public on the ice age peoples of North America.

DIRECTOR'S MESSAGE

The working agenda in a major project is always changing: as one phase of the project nears completion, another phase is just beginning.

BUILDING PLANS for Renaissance ROM are now 97 percent complete, as you would expect, since we are fully under construction and renovation. We are currently working on final finishes, signage, and technical fit-outs as the structural steel starts to emerge from the ground on Bloor Street. Building plans are pretty well done.

Gallery plans are about 80 percent complete, as we issue tenders this fall for cases, lighting, and design supports. The focus for galleries is shifting to text, the making of mounts, and the logistics of installation, which begins in January 2005 for the galleries of China, Japan, and Korea.

The broader planning agenda now moves to visitor services and amenities—restaurants, shops, ticketing systems, seating, touring, hosting, and wayfinding. We call this basket of issues ROM 05—the software part of the project that speaks to the wider needs and interests of visitors when they come to the transformed ROM in late 2005.

Leading this dimension of Renaissance ROM is the director of Visitor Experience, Cheryl Blackman, who joined the ROM in April from a distinguished career at Air Canada to fill this newly created role. Cheryl is concerned with the quality of visitor experiences aside from exhibits and programs. Consider getting a ticket:

In the 21st century, we expect convenient options in how we buy goods and services, including tickets to events and programs. We might want to buy our ticket in advance at home, on line. We might want to avoid any line at all by swiping a card through a kiosk on Bloor Street, and have the ticket in our hands in 20 seconds. As a ROM Member we don't want any ticket hassle at all. Yet, for those people who still prefer the human face behind the desk, that must be available too.

Cheryl Blackman, director of Visitor Experience

BRIAN BOYLE, ROM

So all these options will be presented through ROM 05. Internet and kiosk ticketing will join the traditional desk, assisted by greeters and membership staff. We want to speed and simplify this often frustrating process.

Visitors have an enormous variety of questions and needs in a major museum environment. A reservation at the rooftop restaurant? A wheelchair or baby carriage? A private changing room? Advice on how to structure a visit? Information on special events, space rentals, or family memberships? How to book a visit for a school classroom next May? A suggestion on how to improve the ROM?

The new Hyacinth Gloria Chen Court just inside the main entrance will contain a "concierge desk" where a variety of services and aids can be found during regular museum hours. Like any good host, the ROM will be actively on the lookout for its guests.

ROM 05 includes a task force on accessibility, chaired by ROM Trustee Christine Karcza. The task force has examined best practices elsewhere, and gone over building and exhibit plans with our consultants. In a project of this complexity, not every ideal can be realized, but it is our aim to be among the most thoughtfully accessible museums in the world when the new facilities open.

What about hours of operation? Do they create barriers to use by expected ROM visitors?

What about communication to the public about special events and new features? Are we leaving many potentially happy visitors in ignorance?

Are noise levels too high? Are the exhibits always clean, up to date, and technically robust?

What about languages? Do we offer intellectual access to the exhibits in more than two or three?

How do we appear—lumpy or crisp? How do we act—cool or warm?

ROM 05 is looking ahead to many aspects of visitor satisfaction beyond the wonders of the collections and special presentations themselves. When the time comes, we hope it shows.

William Thorsell is director and Chief Executive Officer of the Royal Ontario Museum.

975.50.1 / BRIAN BOYLE, ROM

Radha and Krishna

A Gender-Fluid Portrayal

A CURSORY GLANCE at the 17th-century Kangra painting featuring Radha and her lover Krishna, who according to Hindu mythology is considered an incarnation of the god Vishnu, might elicit a double take. This miniature painting in the ROM's collection portrays the fair-skinned Radha in her male lover's attire and the dark-skinned Krishna wearing his female lover's garments.

Raised in the Yadava clan, the mischievous Krishna spent his boyhood charming milk maids with the music of his flute. Of all the young Gopis, he came to favour Radha. Allegorically, Radha is a symbol of the human soul (atman) that always longs to unite with the ultimate universal reality (Brahman) here seen in the form of Krishna. The Radha-Krishna story, made popular in the text *Bagavata Purana*, makes use of the human emotion of romantic love as a metaphor for the love between the devotee and the divine.

There are many Indian miniature paintings in which Radha and Krisha exchange certain items of clothing and adornments. This painting in the ROM's collection is unique in its seemingly complete exchange of gender. The female lover, Radha, is shown wearing Krishna's crown and holding his flute in her right hand, both symbols of power. Facing Radha, Krishna wears his lover's clothing and jewellery and is depicted as a female with breasts. Furthermore, Radha is seen as the more active partner with her left arm over Krishna's shoulder, while Krishna is depicted with a bashful expression. The artist even follows the convention of placing the consort to the left of the male by drawing Krishna on the left side of Radha. The dark skin of Krishna is the only remaining iconographical feature that identifies him as the male lover. The complete switching of genders in this painting reflects the Hindu idea of fluidity. The human soul is seen as gender inclusive or gender neutral, able to inhabit a male or female body. Hence, divine coupling is celebrated in its myriad forms of relationships. The painting also comments on the power dynamics associated with the genders. This unique painting from the Moghul era in the ROM's collection welcomes viewers to ponder the continuum of gender.

—Sudharshan Duraiyappah

921.1.224 / BRIAN BOYLE, ROM

Mandala of Vairochana, early 20th century, Tibet.

A Buddhist Mandala

Climbing Mountains with the Mind

THIS FINELY RENDERED mandala, which came into the ROM's collection in 1921, is a beautiful example of Himalayan Buddhist art. Notable for its intricate geometric design and symbolic complexity, the 45.7 centimetre (18-inch) painting containing 188 different figures of Buddhas, Bodhisattvas, and protective deities provides a window into the expansive Buddhist pantheon.

The mandala features the Transcendent Buddhas (*Jinas*), who represent the totality of the enlightened mind. In the centre of the inner circle is white *Vairochana* ("shining one"), who embodies the transformation of delusion into mirror-like wisdom, and from whom all other Buddhas emanate. Around him are the other four Transcendent Buddhas positioned in the cardinal directions. Five is a symbolic number expressed visually here in the five Buddha figures, five directions, and five colours. Red is symbolic of the west, green of the north, blue of the east, yellow of the south, and white of the centre.

A mandala is a cosmic diagram. The bright, juxtaposed colours are intended to create the optical illusion of three-dimensionality. The mandala can be understood as a blueprint for an architectural environment—the inner diagram of circles and squares represents a sacred palace, rising upward out of the painted surface with the peak at the centre. The palace is situated in a green garden decorated with auspicious symbols. Multi-coloured petals of a lotus throne support this world, and beyond it is a ring of celestial clouds. The outermost ring is a multi-coloured circle of flames. This devotional painting was made as a visualization aid for meditation, helping devotees to reach a higher state of consciousness.

Buddhism originated in northern India in the 6th century BCE and spread throughout Asia in the following centuries. Tibetan Buddhism developed into a unique and sophisticated spiritual tradition with an equally compelling artistic tradition. An appreciation of Buddhist art can come from decoding the manifold meanings in such highly symbolic images. Its symbolism makes the mandala a useful object for spiritual practice. This mandala will be featured in a section on ritual art in an upcoming Outreach exhibit, *Ornamenting the Ordinary: The Crafts of South Asia*.

—Sarah Richardson

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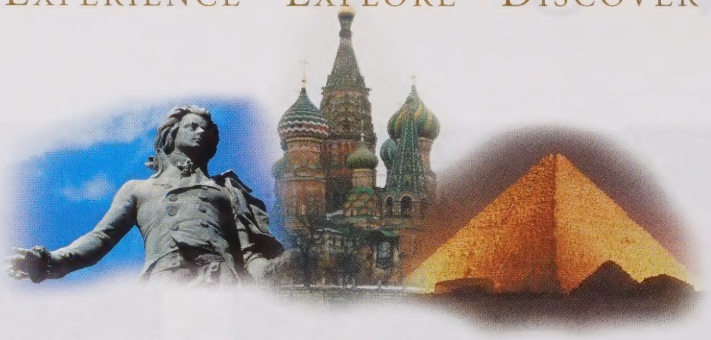

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Fossil Superstars

A series of spectacular trilobite specimens recently acquired from Morocco exemplify these extinct animals' status in the paleontological world as ancient, beautiful, and long-lived.

56379 / BRIAN BOYLE, ROM

Acadoparadoxides briareus—Middle Cambrian, about 520 million years old. The largest of the 13 + specimens is 40 cm (15.6 inches) long.

DAVID RUDKIN

"Every field needs a primary symbol, an image that can serve as a rallying point and an emblem of pride. Nations have flags; universities have mottoes (usually in Latin). Invertebrate paleontology has trilobites."

So wrote the late Steven Jay Gould in his preface to Harry Whittington's 1992 book entitled, simply, *Trilobites* (Fossils Illustrated, Volume 2, The Boydell Press, Woodbridge, UK). There's little doubt that, along with dinosaurs, trilobites are among the most familiar and appealing symbols of the fossil record, an iconic status that Gould attributed to two principal criteria: age and beauty. They certainly do qualify in terms of age, for trilobite fossils first appear in rocks that are about 540 million years old. As far as beauty goes, even to the paleontologi-

56310 / BRIAN BOYLE, ROM

Selenopeltis species--Upper Ordovician, about 450 million years old. This is a fine grouping of one of the largest known species of spiny odontopleurid trilobites. The biggest specimen in the assemblage is about 20 cm (7.8 inches) long, including the tail spines.

cally uninitiated many trilobite fossils are indeed intrinsically attractive objects. And I'd add yet another age-related attribute that contributes to their mystique: longevity. As a clearly definable group of organisms, trilobites persisted for close to 300 million years; their final extinction, 250 million years ago, literally marks the end of an era–the Paleozoic Era to be precise–the first of the three most recent great divisions of geological time. Thus, the trilobites' earthly span was almost double that of their fossil co-stars, the Mesozoic dinosaurs.

Through the generous support of the Louise Hawley Stone Charitable Trust, the Palaeobiology section (Natural History) at the Royal Ontario Museum has recently acquired a series of spectacular trilobite specimens from Morocco. These are destined for display in a planned new Renaissance ROM gallery (working title: Earth and Early Life) that will trace the history of life on this planet from its microbial beginnings to the rise of the first dinosaurs.

So what, in fact, *were* trilobites?

In the grand hierarchy of life, trilobites constitute an extinct category of the Arthropoda, an immense and staggeringly diverse array of non-vertebrate animals whose living members include the scorpions and spiders, crabs and shrimps, beetles and butterflies, and all their myriad kin. The arthropods, in general, are often considered to represent an evolutionary and ecological success story unparalleled in any other group of animals. Today, arthropods are present, often in amazing varieties and great numbers, in virtually every imaginable habitat on the planet, from the deepest oceans to the highest, driest deserts—they live in, on, and around a multitude of other organisms (including us, of course). They swim, creep, drift, hop, burrow, fly, and hitchhike, usually with the aid of the jointed appendages for which the entire group is named (*arthro* = jointed; *poda* = foot). They also wear a layer of supporting, protective armour on the outside of their bodies (including the appendages) in the form of a stiffened or mineralized exoskeleton, which has to be moulted periodically to allow growth. Arthropods can and do utilize all manner of substances for food, and are themselves highly prized as food by all manner of other creatures (again, including us). In fact, arthropods are so intricately woven into the ecological fabric of the Earth that they bring an unintended truth to the old aphorism, "You can't live with 'em, and you can't live without 'em."

Relating the entire arthropod story would require, literally, countless volumes, if for no other reason than that we have no idea exactly how many different kinds exist on Earth today. Even the tale of the wholly extinct subset of trilobites, constrained as it is within a 290-million-year interval, will, in barest outline, fill three or four weighty new tomes of the *Treatise on Invertebrate Paleontology* (a standard reference work for the discipline).

Several characteristics help to distinguish typical trilobites from virtually all other arthropod groups, and these are mostly related to their possession of a thoroughly calcified exoskeleton made up of articulated elements that covered the dorsal (upper) body surface. The exoskeleton featured a raised central lobe and two flanking lobes, running along the length of the animal (hence *tri-lobe-ite*). The calcified exoskeleton was

further divided, cross-wise, into three regions from front to back: a large head-shield (cephalon); a middle region (thorax) consisting of a variable number of narrow segments; and a solid tail-shield (pygidium) of fused segments. The cephalon usually bore a pair of conspicuous compound eyes, also calcified, on either side of a swollen central area. The cephalon of most trilobites was made up of a small number of individual pieces that could be separated along symmetrical lines of weakness to facilitate moulting. Hinge-like articulations between the multiple segments of the thorax allowed most trilobites to flex in the middle, and even to roll tightly into a ball with the pygidium tucked under the cephalon. Based on this fairly simple trilobed body-plan, various groups of trilobites evolved an extraordinary range of exoskeletal sizes, shapes, and elaborations throughout their long history.

Trilobites were exclusively marine creatures—all lived in the oceans and shallow seas of the Paleozoic world, where most walked on, or swam just above, the seabed. Their exoskeletal remains were buried in seafloor sediments, mostly as separated moult pieces or decayed and disarticulated carcasses—complete trilobites represent undisturbed carcasses and are much less common. Non-mineralized parts of trilobites, such as appendages, are only rarely found preserved in the fossil record.

The study of trilobites provides important insights into how life and the Earth changed over the course of nearly 300 million years, yielding clues to such things as the completeness of the fossil record, the nature of ecological reorganizations in the marine realm, and rates of extinction and recovery during major biotic crises. And, as ancient, beautiful objects, they have engendered wonder and inspired generations of enthusiastic fossil collectors of all ages and from all walks of life.

David Rudkin is assistant curator of Palaeobiology, ROM Natural History.

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Beyond Hieroglyphs

The late ROM Egyptologist Nicholas Millet uncovers the meanings from symbols on an ancient Egyptian cartonnage in this re-run of a classic article.

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Thorny Issue

Examining the DNA from seeds of hawthorns using flow cytometry reveals the secrets of their reproduction.

Fluorescence micrographs of hawthorn pollen tubes growing in the stigma, shortly after germination of the pollen grains (above), and of a single pollen tube approaching an ovule (below). The stigma and the ovule are each about a millimetre (.04 inches) in diameter.

M. PURICH

TIMOTHY A. DICKINSON

In July and August fencelines and thickets across much of Ontario are dotted with bushes or small trees conspicuous only for their dense foliage that is borne on thorny, often very thorny, branches. Most of these bushes are hawthorns, members of the genus *Crataegus*, in the Rose family (Rosaceae). On many of these hawthorns a careful observer will find clusters of green, reddish green, or purplish green fruit hidden among the leaves. At this point, in midsummer, the fruits do little to help us identify a particular species of hawthorn among the 30 or more different species found in Ontario, as both flowers and ripe fruits are needed to do that. Nevertheless, recent work by graduate student Nadia Talent has made these nondescript immature fruits yield a great deal of information about hawthorn reproductive biology.

In contrast to their drab midsummer appearance, just a couple of months earlier these same bushes, on which ripening fruits can now be discerned, were each a mass of white flowers. Many different kinds of insects visit the flowers when they open. Some insects (adult flies, bees, beetles) apparently feed on the pollen and nectar. Pollen-gathering bees, with their hairy bodies, are especially effective in moving grains of pollen from the **anthers** in which they are produced to a **stigma** in the same or another flower. For many species of hawthorns self-pollination results in seeds being produced or "set," but in many other species only pollen from another individual is effective.

Hawthorn flowers last for only a few days after which, if pollination hasn't resulted in seed-set, the flowers drop off. In most cases it seems

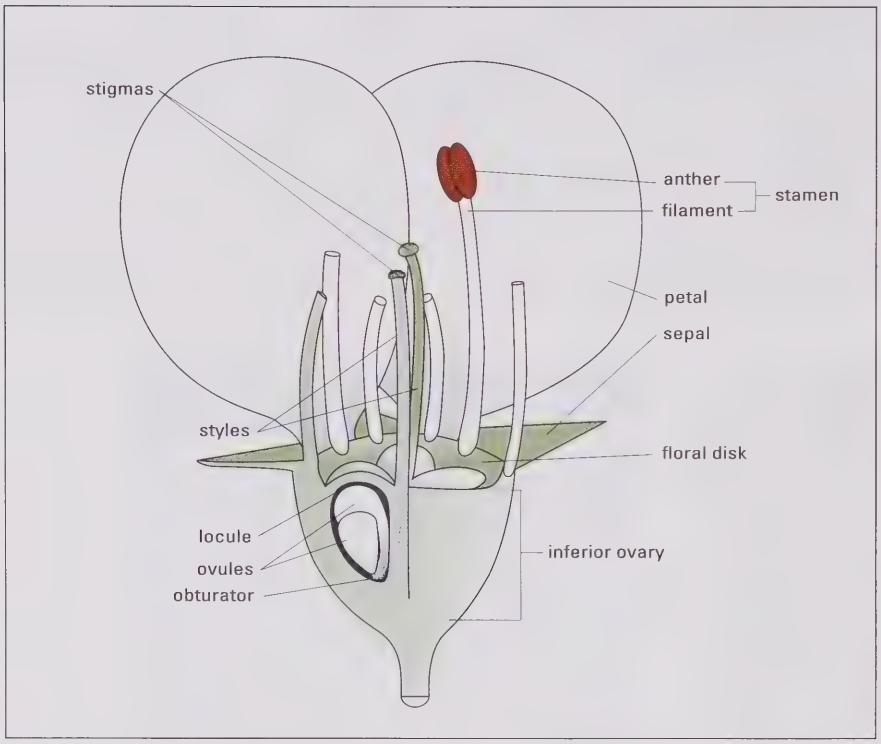

DIAGRAM: T. WINTERHALT / PHOTOS T. A. DICKINSON

Left: Hawthorn flower sliced in half lengthwise to show the parts referred to in the text, and the path taken by the pollen tube, from the stigma to the lower of two ovules. **Right:** Flowers of downy hawthorn (*Crataegus mollis*, above; *C. submollis*, below), showing the colour change associated with removal of pollen from the anthers.

that everything important is likely to happen on the first day that a flower opens. In the morning the **sepals** and **petals** open, and the anthers are exposed to the open air. They burst open, revealing masses of sticky pollen grains that are soon removed by visiting insects. By late afternoon on a sunny day when insects have been active, all the anthers have been cleaned out, and pollen grains have been left on the stigmas. In many species, the **floral disk** will have changed colour from yellowish green to reddish pink, suggestive of a signal to pollinators that the flower is no longer a food source. Over the next day or two the pollen grains absorb water from the stigma. A tube of cytoplasm emerges from the pollen grain and burrows into the stigma and then begins to grow down through the **style** toward the **locule** at its base.

The two nuclei that were present in the pollen grain have moved into this tube, and in it, somewhere along the way through the style, one of them divides to form two sperm nuclei. The pollen tube emerges into the locule at the point where a knobby structure called an **obturator** is located. The obturator apparently guides the pollen tube toward the tip of the nearest **ovule**. The pollen tube finds the tiny opening in the tip and burrows in until it reaches a narrow, balloon-like structure in the centre of the ovule. The two sperm nuclei are discharged into the nearest part of the balloon. Inside the balloon, at the tip where the pollen tube entered, lies an egg cell containing a nucleus with which one of the sperm nuclei fuses. In the middle of the balloon are two more nuclei, and these fuse with the remaining sperm nucleus.

What happened in this hawthorn ovule is the same thing that happens in virtually all flowering plants: double fertilization. The first fusion represents the fertilization of the egg, forming the single-celled zygote that gives rise to a new individual (the embryo) with half of its genetic information (DNA) from the "mother," the bush that produced the flower in which these events take place, and half from the "father," the plant on which the pollen grain originated. In cases where self-pollination works, the mother and father are the same individual. In other cases, however, only pollen tubes developing from pollen grains that came from another individual are able to grow all the way through the style to the ovule.

The second fusion of nuclei is just as important, even though it doesn't result in a new individual plant. Instead, a new nucleus is formed that contains twice as much maternal DNA as it does paternal DNA. It goes on to divide to form a tissue called **endosperm** on which the developing embryo depends for its nutrition as it develops from a single cell into a tiny plant.

By fall all of these events will have come, appropriately enough, to their fruition. The **inferior ovary** of the hawthorn flower will have enlarged to become a mature fruit, usually red, but sometimes purple-black or yellow, with a soft, juicy outer layer enclosing one or more hard woody structures ("stones") within each of which a mature seed may be found. Each seed will consist of an embryo plant, enclosed in the remains of the endosperm and the outer parts of the ovule.

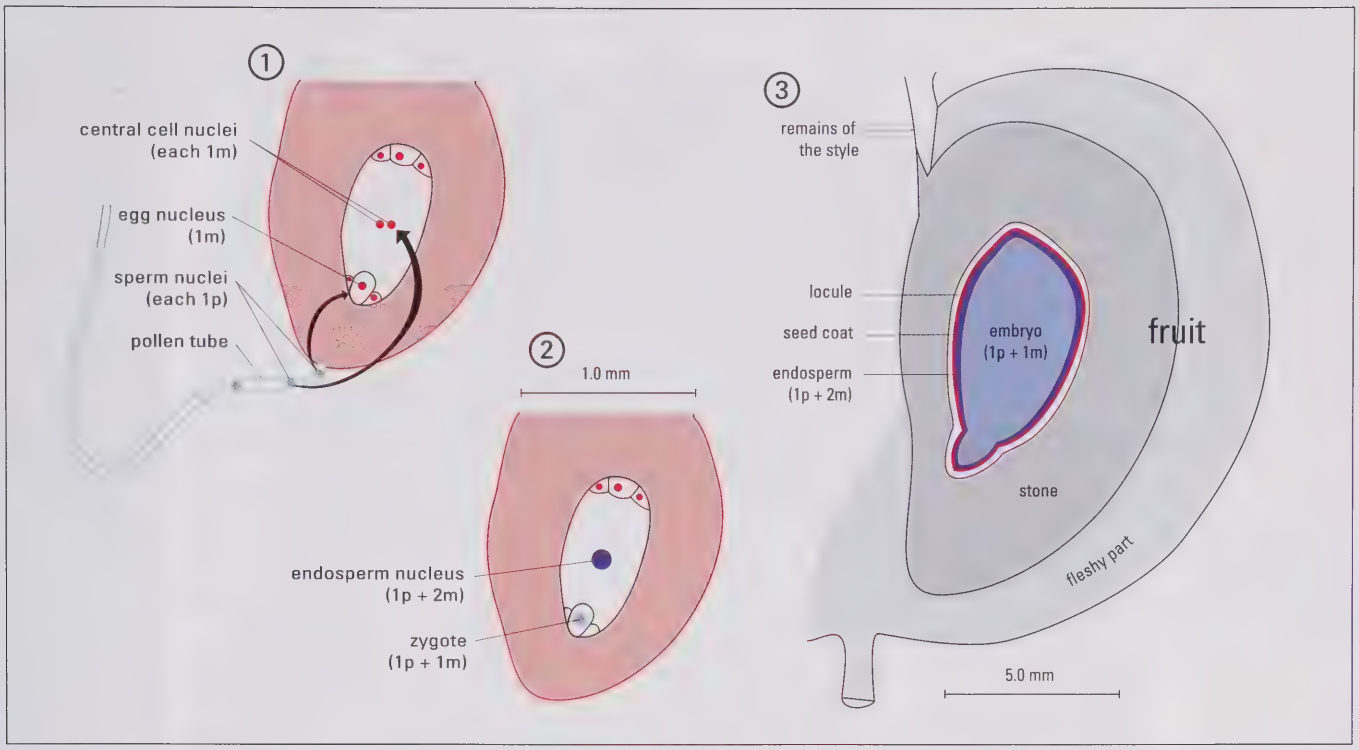

DIAGRAM: T. WINTERHALT

Double fertilization (1) Ovule and pollen tube shortly before double fertilization occurs, showing the maternal nuclei in the ovule (red) and the paternal nuclei in the pollen tube (blue). The nuclei contain the genetic information (DNA) from each parent, tightly packed into the chromosomes. (2) Ovule after double fertilization has occurred. The zygote (light purple) contains an equal number of chromosomes from each parent. The endosperm nucleus (dark purple) contains twice as many maternal chromosomes as paternal ones. (3) Part of a mature fruit, in longitudinal section. When the seed is mature, it comprises a seed coat derived from the maternal tissue of the ovule (red), some endosperm (dark purple), and the embryo (light purple) that will germinate to form a new plant.

Nadia Talent has collected immature seeds in July and August, in many cases after having made the original pollinations herself, by hand, and has analyzed the DNA content of nuclei from the embryo and endosperm. To do this she uses an apparatus called a flow cytometer, a machine that measures the DNA content of individual nuclei as they flow past a detector, carried by a narrow stream of liquid. Neither the ROM nor the Botany Department at the University of Toronto has such a machine, but fortunately there is one at the university's Faculty of Medicine. Nadia has become skilled at preparing nuclei from hawthorn leaves, pollen, and seeds for analysis by flow cytometry. She has been able to relate the DNA content of nuclei of pollen and ovule parents ("fathers" and "mothers") to the DNA content of embryo and endosperm nuclei from individual seeds in such a way as to be able to tell what kinds of crosses between species are likely to be possible in nature. By making controlled pollinations she has also been able to show that in many cases embryos develop asexually, that is, without any genetic contribution from a pollen parent ("father"). While these data confirm results obtained by earlier workers, they tell us a great deal more than earlier work could about how hawthorns actually reproduce, and how the quirks of their reproduction may have contributed to the diversity of Ontario hawthorns.

When you walk out into the midsummer heat and see hawthorns along fencelines and in thickets, look for the clusters of maturing fruit hidden among the leaves and think of the microscopic events that have been going on within each one. The kinds of events just described for hawthorns occur, with slight modifications, in the formation of every seed of every flowering plant in the world. In fact, we have known since work done during the 19th century that the general pattern of these events is the same in all land plants. Together with modern biochemical evidence about the photosynthetic pigments common to green algae and land plants, these data about how plants reproduce provide strong evidence that all land plants have evolved from a common ancestor that learned how to live in air, rather than water, hundreds of millions of years ago.

The data on hawthorn reproduction described here were culled from the literature and especially from my own studies and those of students who have worked with me, including Nadia Talent, Melissa Purich, Svenja Belaoussoff, and the late Nina Celotti.

Timothy A. Dickinson is the Botany curator in the new ROM Department of Natural History. He is also a co-author of the recently published ROM Field Guide to Wildflowers of Ontario.

THE ILLUSTRATED BUFFALO EXPRESS, OCTOBER 4, 1891

TALES FROM THE ARKANSAS POTTERY BELT

In the 1880s, vast stores of pottery in Arkansas's St. Francis River Valley drew excavators to the area in droves. Some were archaeologists, others were not. **By Mima Kapches**

In 1976 archaeologist David Brose, former ROM vice-president of Collections and Research, happened upon a collection of vessels at the Cleveland Museum of Natural History. A letter inside one of the pots stated that it had been excavated by C. W. Riggs in Cross County, Arkansas. But it was the newspaper in which the vessel was packed that provided the best information. The October 4, 1891, edition of the *Illustrated Buffalo Express* contained a long article on the colourful character who preferred to be called Captain Riggs. With "abundant mustachios and flowing goatee," and at 1.9 metres (6 feet 4 inches) tall, Riggs cut an imposing figure. An accompanying photograph shows him at age 34, a rough and tumble backwoodsman dressed in wilderness clothes with his musket by his side. Riggs lived with his wife and two sons on a houseboat 20 metres (66 feet) long and 4.3 metres (14 feet) wide. In it, he says in the article, "we have sailed the Mississippi, the Missouri, the Ohio, and the St. Francis rivers . . . as I have reckoned it, we have traveled nearly 4000 miles in her."

Until Brose's discovery of the article, little had been known about Riggs—indeed, he is not even mentioned in the history of archaeology

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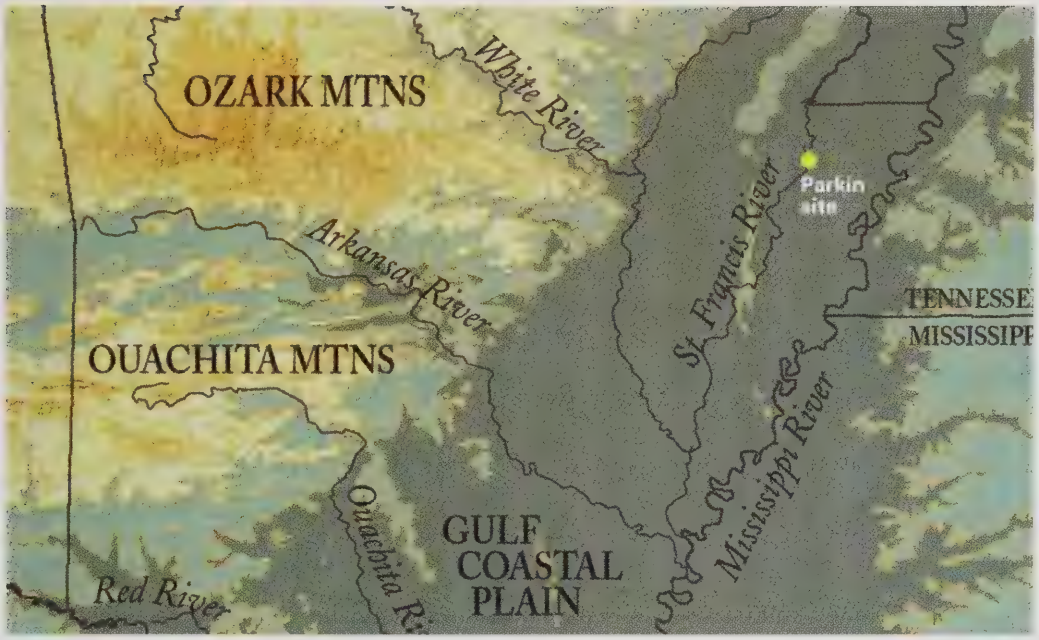


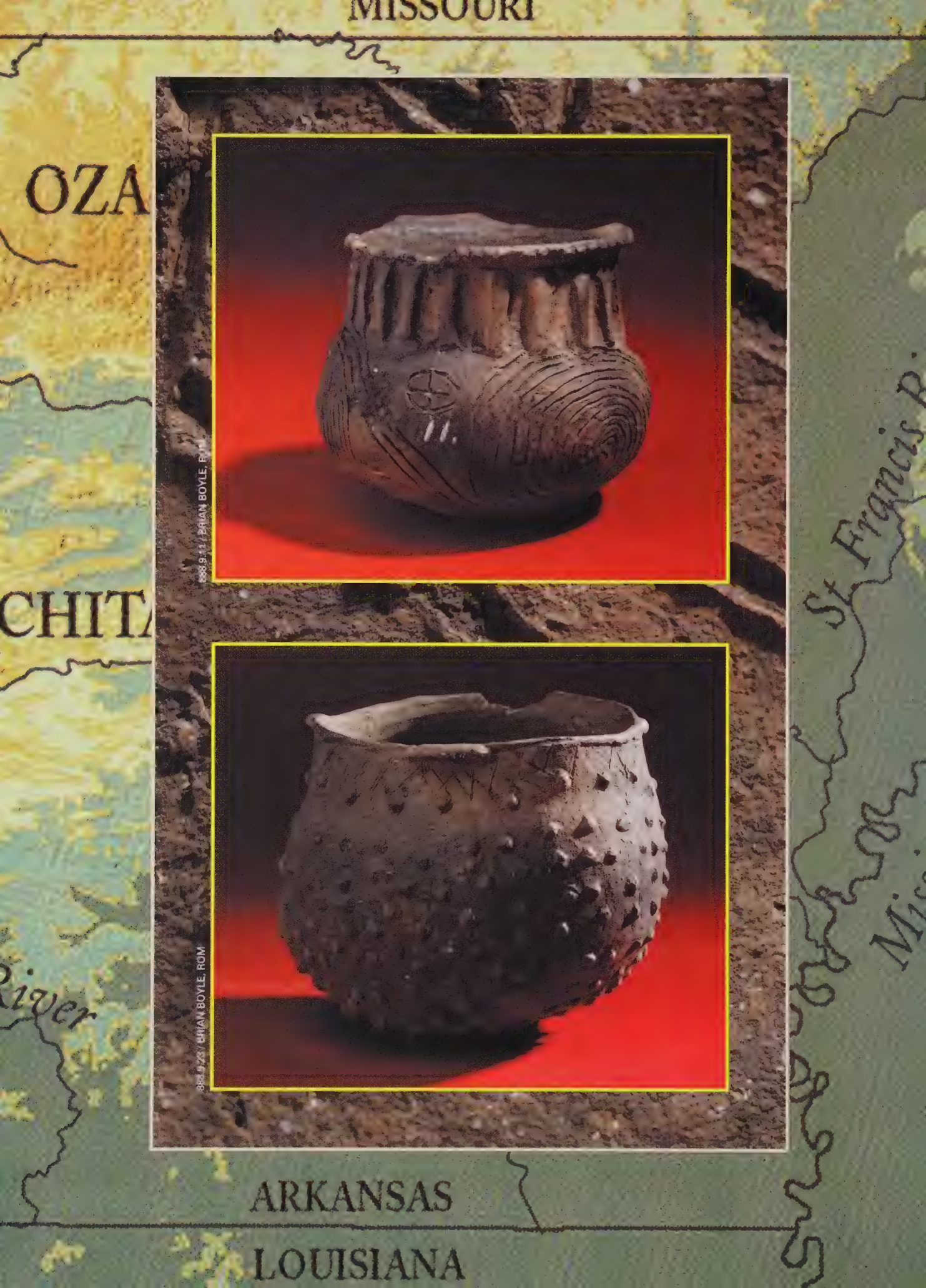
in the southeastern United States written by James Stoltman in 1973. Before 1891 Riggs had already been out West working among the cliff-dwellings of Colorado, where cow-punchers amused themselves by shooting complete pots with their Winchesters. He brought his family East in a prairie-schooner (covered wagon) to work in a different part of America. Captain Riggs's work was purely mercenary. Excavating sites and selling collections were the means to support his family. He was one of several similarly focused individuals who worked the so-called Arkansas "pottery belt." Much of Riggs's collection was sold through Wanamaker's Department Store in New York City or by Riggs himself to museums and private collectors. Today several American museums, such as the Buffalo Museum of Science, have Riggs collections. No one knows what happened to Riggs but in his own words, "I suppose I'll be a wanderer until the end of my days."

The ROM, too, has a C. W. Riggs Collection, a large group of pottery vessels and bowls from Arkansas dating to about AD 1300–1550. Research on collections acquired in the late 19th and early 20th centuries is both frustrating, thanks to lack of documentation, and fun, thanks to the opportunities of making new discoveries. Studying the Riggs collection allowed me to research a large and complex prehistoric ceremonial culture in the central Mississippi region of the United States, called Mississippian. But not only was I able to examine the story of the powerful cultures that made the ceramics long ago, I also happened upon the colourful history of the collector himself. Planning for new gallery spaces for the Royal Ontario Museum has allowed curators like me the chance to look into unusual collections from areas that we do not usually study and with which we do not ordinarily work.

David Boyle, curator and director of the Ontario Provincial Museum (whose collections came to the ROM in 1933), wrote in the 1887/88 *Annual Archaeological Report* for Ontario:

"For more than a quarter of a century have

Opposite page top: This is thought to be a Neely's Ferry Plain frog effigy bowl, 9 cm (3.5 inches) tall, 20 cm (7.8 inches) in diameter. Ferry Plain frog effigy bowls are unique—but considering the Mississippi Valley is home to the largest bullfrog in the Americas, the presence of the frog effigy is not unexpected. Bottom: An outstanding pot from the Riggs collection is this small Rhodes incised pot with three arcaded handles, 9 cm (3.5 inches) tall and 9.5 cm (3.7 inches) in diameter.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our American scientific neighbours acted towards Ontario in a most friendly manner, visiting us frequently, carrying off to Washington and elsewhere every specimen worthy of preservation in their cabinets, and it seemed to me only fair even at this late day, to evince a spirit of good fellowship by way of reciprocity. It is therefore gratifying to state that acting upon this principle we have been able to add about five hundred objects of interest to the Provincial Archaeological Museum." [p.10]

These 500 objects included 67 of C. W. Riggs's finds from Arkansas, a substantial collection of complete vessels for the Ontario Provincial Museum and later the ROM to own. Boyle was on a mission to obtain complete vessels.

While to men like Riggs pottery represented an income, there were others who took a more scholarly approach. Clarence Bloomfield Moore (1825–1936) was a wealthy Philadelphia socialite, who, after adventuring around the world, turned his attentions closer to home and took up archaeology. The St. Francis River of Arkansas was a far cry from the Amazon, but it was infinitely safer and just as interesting. Moore's finds constitute the other 430 or so pieces Boyle acquired. Moore was a meticulous excavator. From his own publications through the *Journal of the Academy of Natural Sciences* of Philadelphia, we know how he conducted his work. He chartered a 30-metre (100-foot) stern-wheel steamer, and with a crew of five, plus six excavators, he spent the winter months excavating sites along the rivers of Arkansas, Georgia, and Florida. During the summer he analyzed his collections and then promptly wrote and published his reports.

Why were excavators and collectors drawn to this region of Arkansas? To begin with, the quantity of ceramic vessels produced here was prodigious. In his 1910 report of his work in Arkansas, "Antiquities of the St. Francis, White, and Black Rivers," Moore stated that the St. Francis River area was one where there were "great dwelling-sites, which have increased in height gradually through long periods of occupancy. . . . The St. Francis River valley has yielded more examples of its ware than has any equal area in the United States . . . ." In his survey of 1909–1910, written up in the *Journal of the Academy of Natural Sciences*, Moore noted that "fourteen hundred and fifteen vessels, whole and broken, were found . . . on the St. Francis river. . . . All of these vessels were most carefully examined . . . before being rejected in place, being given to owners of the lands, being turned over to minor institutions or reserved for our collection. . . ."

David Boyle's Ontario Provincial Museum would seem to have been one of those minor institutions that received Moore's largesse.

In Ontario excavations it is very rare to find complete pottery vessels, so the quantity of pots retrieved during one of Moore's or Riggs's excavations is mind-boggling.

What culture produced this quantity of material? The sites excavated included large palisaded villages, where people lived in small houses. In the village a few large platform mounds were built where the tribal chief and his family had their homes. The size of the villages and how long they were occupied, over hundreds of years, meant that a great quantity of pottery was produced. The towns were occupied from about AD 900 up until the beginning of the historic period, about AD 1550.

This central Mississippi region is one where nature's abundance flourishes even today. In the past, the natural resources were astounding. Edible plants included acorns from oak trees, wild rice, wild potato, greenbrier, Jerusalem artichoke, wild onions, and a great variety of berries, nuts, and fruits. Mammals, birds, and fish resources were plentiful; white-tailed deer were common, and as many as half a million mallards wintered in the area. Fishing was excellent. The largest variety of bullfrog found in the Americas lived in the area. With a short and warm winter (4°C) and hot summers, the cli-

Opposite page top: This Rhodes incised pot 6 cm (2.3 inches) tall and 7.5 cm (2.9 inches) in diameter is one of the more outstanding pieces of the plain-looking Riggs Collection. Bottom: The large Fortune noded pot 17 cm (6.6 inches) tall and 17 cm (6.6 inches) in diameter is another of the more decorative pots in the Riggs Collection.

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mate was ideal for horticulture, and by AD 400 the locals were planting corn and squash and were starting to build mounds for ceremonial structures. The Mississippian period, from AD 900 to 1550, was one when large complex political and cultural centres were constructed along the Mississippi River. Thousands of people lived in these towns. Some of the settlements were large cities. The inhabitants needed containers for their food and great numbers of bowls, jugs, and pots were made, all by hand, without a potter's wheel, probably by pottery specialists, for sale and trade.

Although Riggs noted the counties where his vessels were excavated, he named no exact site provenance. The ROM collection of Riggs pottery comes predominantly from the St. Francis River, Cross County, Arkansas, and dates to about 1300 to 1550, a period called Late Mississippian. In Arkansas many smaller ceremonial sites existed along the St. Francis, but the main site in the region after AD 1300 was the Parkin site. Because the Spanish conquistador Hernando De Soto visited this site in the summer of 1541, we know the site's native name, Casqui. Based on an analysis of the language spoken, these people are thought to be Tunican, members of tribes who inhabited the region and are known to have dried and sold salt. Tragically, just 132 years later, by 1673 when the French explorers Marquette and Joliette passed the confluence of the Arkansas and Mississippi rivers, the local native population had been decimated by European diseases, and the large sites had been abandoned.

The pottery vessels these peoples left behind capture the early contact era, even though the collection Boyle acquired from Riggs, in contrast to the one at Buffalo, was small and rather mundane. Mostly it contains plain rimmed bowls, undecorated long-necked bottles polished in red, and others not polished but with dull surfaces. There are, however, a few interesting vessels in the collection and these have been selected for display in the new gallery, temporarily titled the Americas, Africa, and Asia-Pacific Gallery. The names of the types of vessels identified—Fortune, Neeley's, and Rhodes—are often attributed to the sites where they were first found and described.

It's fair to say that Moore's and Riggs's pots at the ROM form an excellent collection. Certainly they increased Boyle's numerical count of complete vessels. When compared to the stunning vessels illustrated by Moore from his work on the St. Francis River in 1909 the ROM's collection is a plain one. Moore did note, however, that the vast majority of pots, bowls, and bottles were plain and functional ware and that the unique and special vessels were rare—no doubt that is why they were kept for American institutions. Still, the ROM is fortunate enough to have one such item, a human effigy bottle donated by Samuel Zacks in 1971.

Today archaeological ethics would not allow for a collection like Captain Riggs's to be acquired. The purchase of archaeological artifacts is not allowed under international UNESCO treaties. Long ago, however, collections like this were numerous—and acceptable.

Large museums like the ROM have continued to house these collections for nearly a century, and despite the unscholarly approach to the way they were excavated, these artifacts which have sat neglected on the Museum's shelves are now becoming recognized as important records of the cultures that made them. Nowadays, as in Boyle's time, Americans are once again visiting—this time as researchers tracking down the collections for study. ■

Opposite page top right: One other unusual specimen in the Riggs Collection is this tripod bottle with three affixed miniature clay masks. It stands 17 cm (6.6 inches) tall and 12.5 cm (4.8 inches) in diameter. Top left: This human effigy bottle, 21 cm (8 inches) tall 9.5 cm (3.7 inches) wide, donated by Samuel Zacks has no exact provenance, though it is likely from the central Mississippi Valley. Bottom: This distinctive type of bowl with an animal's head on one side of the rim and its tail on the opposite side is called a tail rider. From the Moore Collection, it stands 10 cm (3.9 inches) tall, 17.5 cm (6.8 inches) in diameter, and 24.5 cm (9.5 inches) from tip of the bill to tip of the tail.

PARADIGM SHIFTS

Research and fieldwork in evolutionary biology have turned long-held suppositions on their heads.

BY RICK WINTERBOTTOM

PERHAPS ONE OF the bigger thrills in my fieldwork was discovering, on my first ROM expedition to the Chagos Archipelago in the central Indian Ocean, the world's smallest fish. Masquerading as what I initially thought were larval or baby fishes were two species that, on closer investigation, I found to be gobies. Some of these specimens had ripe eggs clearly visible through their sides. A quick check showed that these eggs were in the ovaries, and not in the gut—meaning that the fishes containing them had not eaten eggs for breakfast and were not larvae or juveniles but adult females. The upshot was that Alan Emery, then also a curator of ichthyology, and I wrote the scientific paper describing these fishes as two new species in a new genus of gobies. The genus name, *Trimmatom*, we derived by combining the name of the closely related goby genus *Trimma*, and *atom*, a tiny particle. It was the smaller of the two species that attracted a huge amount of international attention. We called it *Trimmatom nanus*,

PAUL WATSON, THREE IN A BOX

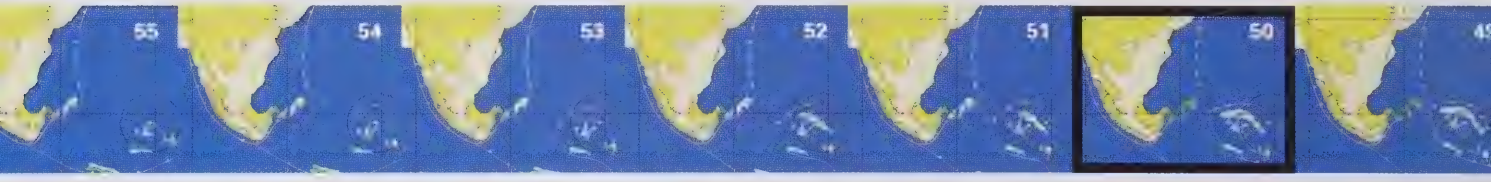
I began to wonder what phylogenetic information implies in terms of the and how organisms have arrived at their present distributions

nanus after the Latin for dwarf. It proved to be the shortest vertebrate ever described, and it is now enshrined in the *Guinness Book of World Records*. We found mature females full of eggs at a length as little as 8 mm from tip of snout to root of tail fin—about the width of a pencil. They are so small that it would take about 63,000 of them, lined up snout tip to tail, to top the CN Tower, or, for the more gastronomically inclined, you would need 3674 adult *Trimmatom nanus* to make a quarter-pound goby burger.

THE YEAR WAS 1979. Although I was just beginning my fieldwork at the ROM, I had long been interested in fishes. As a graduate student in ichthyology I had become curious about how we can uncover relationships between groups of organisms—their phylogenies, or evolutionary history. I then began to wonder what phylogenetic information implies in terms of the evolution and biology of life (concentrating on coral reef fishes, of course!) and how organisms have arrived at their present distributions—an area of study called biogeography. The impetus for one of my recent studies was the incredible diversity of all groups of marine organisms currently living in the seas surrounding Indonesia and the Philippines. I wanted to find out whether or not this rich biodiversity meant that the area was a centre of origin as had long been believed. In order to integrate the relationships (phylogenies) with the biogeography, I had to examine some of the basic assumptions and theories by which biologists interpret their data—the paradigms.

In years past, scientists classified all living organisms according to how they looked because of the way the human mind works. The mind and its ability to process information is one of the most powerful mysteries of nature. The amount of sensory input received by the brain from the eyes alone is, almost literally, mind-blowing. Yet we cope rather well. A significant amount of the incoming information is selectively discarded, and we have an innate propensity to classify what remains hierarchically, in much the same way that a business organization chart is formulated. The hierarchy forms an ever more detailed downward cascade of levels of information into which we pigeonhole things. For example, take the common woodscrew. Usually we lump these in a larger group called "fasteners" or devices to hold two or more things together. But we can also go downwards: we may choose to call the device a Robertson screw because it has a square hole in the top; we may break down Robertson screws by length, by the number of turns per unit measurement, or by how wide the diameter is. Our main tendency is to group together things that look most similar to each other—although, of course, individuals often differ in which features they consider more important. In the example of screws, some people may make their first major division by the shape of the hole or slot in the top, while others may use the length or the width of the shaft to make their first categorization of all the screws in the world. People use this process with almost everything—cars, people, faces, and the fauna and flora that share our world.

For centuries, this is exactly the system we used to classify living organisms. It was an existing paradigm, one of many paradigms that guide almost all science. Paradigms are sets of established theories used by scientists as assumptions to understand more detailed levels of how and why things work. Paradigms allow us to form building blocks of increasing knowledge and understanding, each advance depending in some measure on the blocks that came before. This interplay of paradigm and data results in a spiral of greater insight and information.



But every once in a while, something happens to challenge these cherished assumptions. A previously unknown natural law may be discovered that forces a change in a long-standing paradigm because its predictions no longer always hold true. New evidence may show that the paradigm was always essentially invalid even though it explained most of the facts at the time of its acceptance—this is just what has happened in the last half century

olution and biology of life (concentrating on coral reef fishes, of course!) an area of study called biogeography.

with how we classify organisms. As is so often the case, hints and statements leading to this dramatic change can be found in the writings of Darwin and Wallace, dating as far back as the 1850s—but these suggestions were not woven into a coherent methodology until Willi Hennig, a German entomologist, published his ideas some 100 years later.

Essentially, the problem for biological classifications before Hennig was this: when we classify organisms by their appearance (our natural proclivity), the exercise is subjective, because different people tend to emphasize or be impressed by different attributes. So there could not be (and was not, in many cases) stability to the classification. Organisms at all levels, however, have only one evolutionary history. If we classify organisms according to genealogical family tree, then we should achieve a stable classification. And scientists believe we can unravel those evolutionary relationships if we use something called shared derived characters—that is, when a new species forms, and as it evolves, it develops characteristics that are unique to it and its offspring. Should it split into further new species (as it may), then its descendant species inherit these new characteristics, and also develop their own special characters. It is these special characters that allow us to recover the evolutionary history of the organisms.

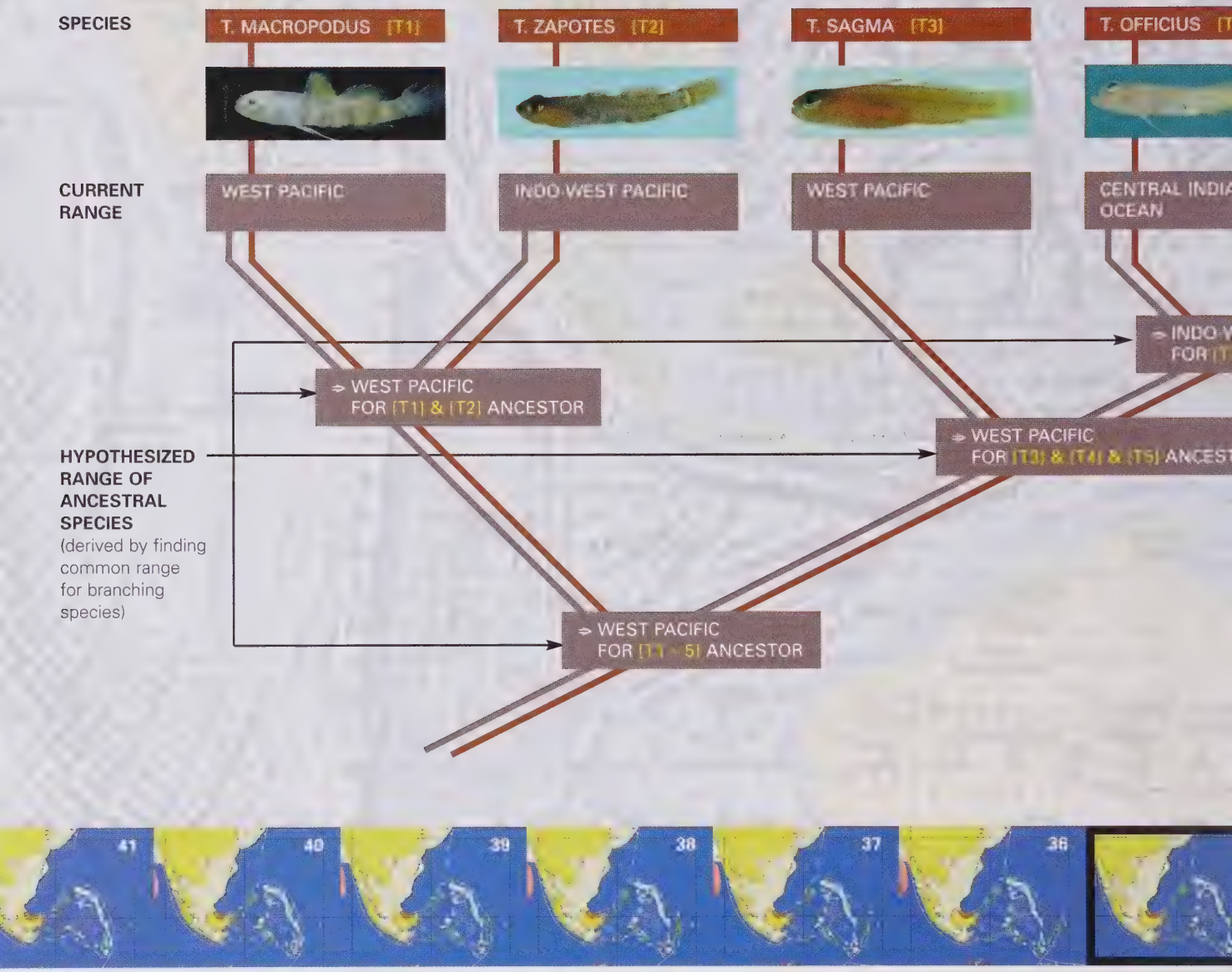
Here is just one example of the contrast between the two approaches: the traditional classification of craniates—animals with the brain enclosed in a hard capsule—consisted of fishes (which live in water and have fins) and four-legged land animals, also known as tetrapods (which include humans and all other mammals as well as birds and lizards). This dichotomy between fishes and tetrapods was reflected in the classification: there was a Class Pisces for fishes, and, anthropocentrically, three classes for the tetrapods—Mammalia, Aves, and Reptilia. In terms of their evolutionary relationships, however, humans (and all other tetrapods) are more closely related to the group of fishes containing the salmon than either of these is to a shark. Today we classify things according to the sequence in which they evolved (and thus their sequence of relationships) rather than their external appearance. Humans and salmon are classified together in a group called Osteichthyes, while sharks are in their own separate group, the Chondrichthyes. There has been a change in the paradigm of how we classify organisms.

In order to formulate a solid classification for any group of organisms, we need to look at all the species in that group. The first step requires having the organisms available for study, and knowing them sufficiently well to feel reasonably sure that you have not left any species out. For my work, that means going into the field to make collections for research—in other words, going to the coral reefs of the Indo-Pacific to collect the fishes, and entering their habitat using scuba gear. Since joining the ROM in 1978, I have been fortunate to visit about 15 different Indo-Pacific localities—fieldwork that has so generously been supported by the Museum during my career. The fieldwork itself is both exhilarating and exhausting, with 16-hour days, seven days a week, for anything up to three months at a stretch.

But the excitement and physical labour of fieldwork, followed by the thrill of finding new species, is not enough to draw conclusions about evolutionary relationships. That requires detective work, closely investigating each member of selected groups that have been collected, and obtaining a lot more information than what is possible from visually examining the external anatomy. I looked at the osteology—the skeleton and skull—of the five species of *Trimmatom*. These fishes have about 170 individual bones packed into their tiny bodies—98 in the head region alone. I examined all of the bones for each species, and found that 48 bones varied among the five species. I used only shared derived characters to arrive at their relationships, outlined in the chart on page 26.

Next, to figure out the historic range of these fishes' ancestors, I added the broad geographic dis-

By using a technique called optimization, in which you take any pair of spec (and repeat until you have looked at all the pairings in the cladogr


SPECIES
T. MACROPODUS [T1]
T. ZAPOTES [T2]
T. SAGMA [T3]
T. OFFICIUS [T
CURRENT RANGE
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INDO-WEST PACIFIC
WEST PACIFIC
CENTRAL INDIA OCEAN
⇒ INDO-W FOR [T
⇒ WEST PACIFIC FOR [T1] & [T2] ANCESTOR
⇒ WEST PACIFIC FOR [T3] & [T4] & [T5] ANCEST
HYPOTHESIZED RANGE OF ANCESTRAL SPECIES
(derived by finding common range for branching species)
⇒ WEST PACIFIC FOR [T1 – 5] ANCESTOR

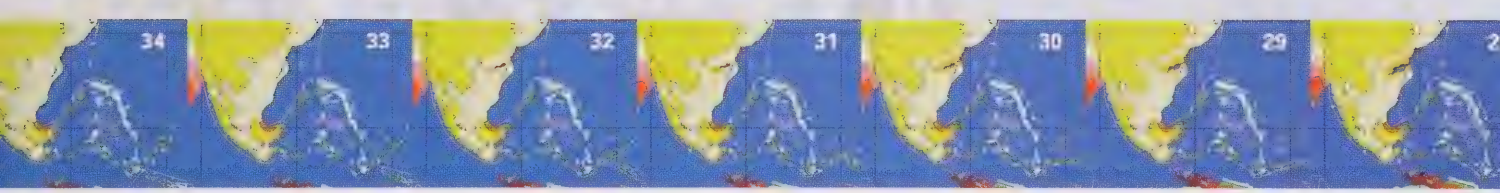
tribution of each species. By using a technique called optimization, in which you take any pair of species or groups and see if they share any common elements in their distributions (and repeat until you have looked at all the pairings in the cladogram), you can estimate the range of the ancestral species (or group of species) of these five recent species—in this case, the western Pacific.

Now, it would be premature to formulate any general biogeographic theories from this single tree of relationships (phylogeny), but if we apply these procedures to numerous phylogenies, we can look at all the results to see whether there are any common patterns. It is common patterns in biology that cry out for a general explanation. I was particularly curious to see whether there were any patterns in the timing of biological events and geological ones—in other words, did new species form or move geographically as a result of the moving of ocean plates?

In order to determine the patterns we again need the specimens for study as well as reliable information as to where the species occur. The map on pages 28–29 shows areas where I have collected samples over the past 25 years and the number of *Trimma* known from

r groups and see if they share any common elements in their distributions you can estimate the range of the ancestral species (or group of species).

In viewing these diagrams, called cladograms, it is important to remember that the vertical axis represents the relative timing of the events; the earliest event in this diagram is the split into the ancestor of *Trimmatom macropodus* and *T. zapotes* on the one hand, and the ancestor of *Trimmatom sagma* plus *T. offucius* plus *T. nanus* on the other. Optimizing data biogeographically (shown in burgundy labels) gives us information for what is shown on the next spread and looks like a phylogeny, but in fact represents the sequence through time in which different geographic areas became separated from each other according to the evidence of their faunas.

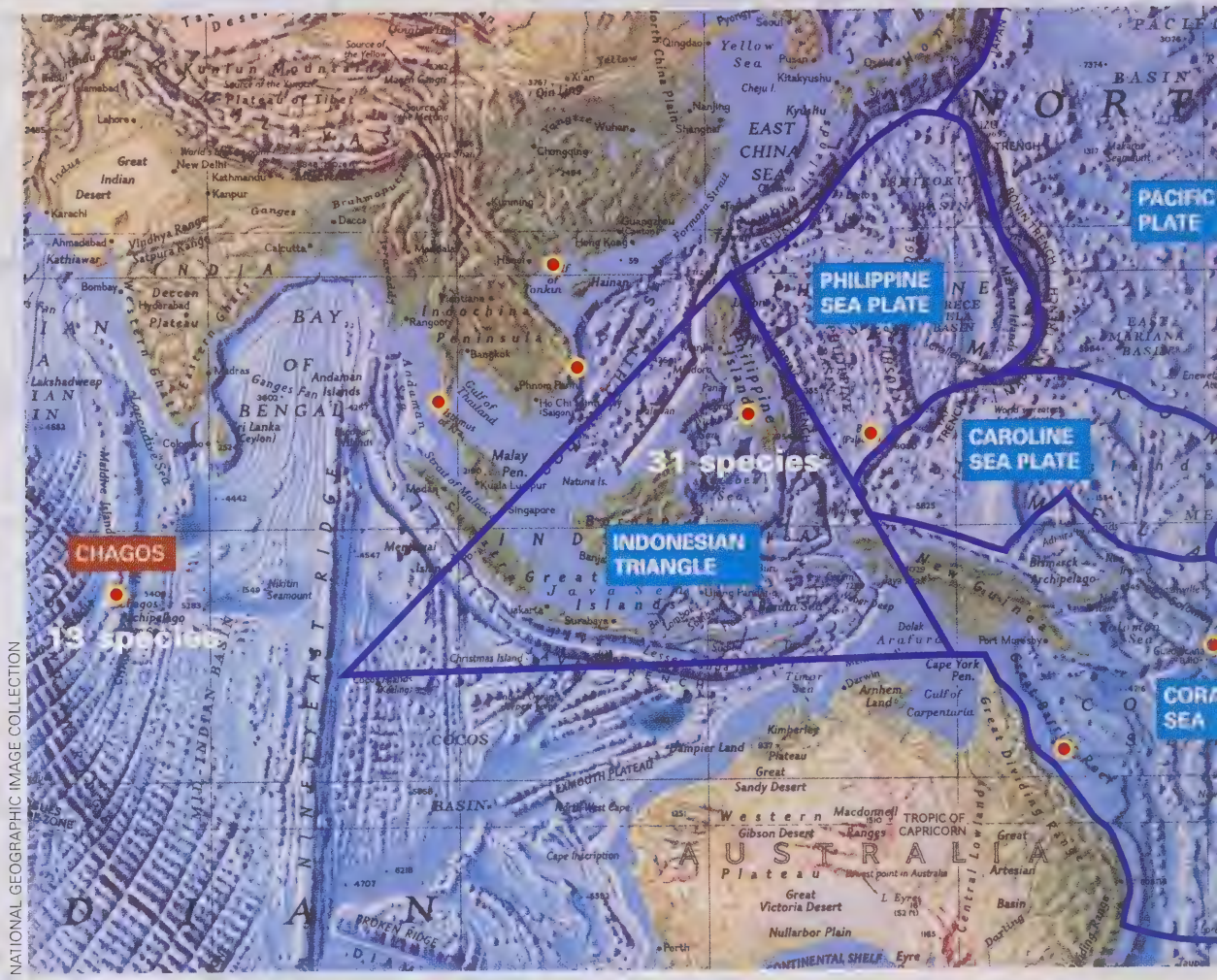


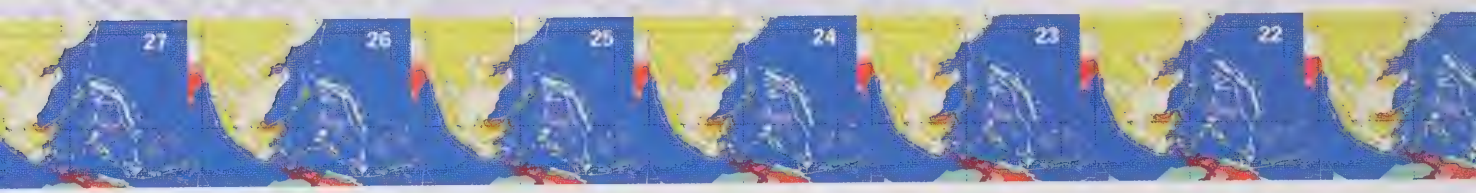
each locality. For determining relationships, I used the methods outlined above to concentrate on *Trimmatom*. First, however, I needed to be sure that the Indonesian/Philippine region actually does have the largest number of species. To verify this, I decided to focus on the related genus *Trimma*—a group of some 80 species of 2.5-cm-long coral-reef fishes (most of which were new to science when I began my studies).

Fieldwork in many different places in the Indo-Pacific confirmed an oft-stated phenomenon—the number of species present at any given locality varies widely, but the numbers fall off the farther the site is from the seas that bathe Indonesia and the Philippines, the so-called Indonesian Triangle, where I collected 31 species of *Trimma*. To the west, at Chagos, I found 13 species; to the east, at Fiji, I found 20 species; and in the Society Islands a mere 4.

Now, what has all this to do with shifting paradigms, evolutionary biology, and biogeography? Well, going back to that analysis of the relationships of *Trimmatom*, and to how that analysis translates in biogeography, I mentioned that one would need many phylogenies to be able to see whether there were any general patterns in the relative timing of

The richness of fauna in the Indonesian Triangle is much more logically expla
a centre where most of the new fo



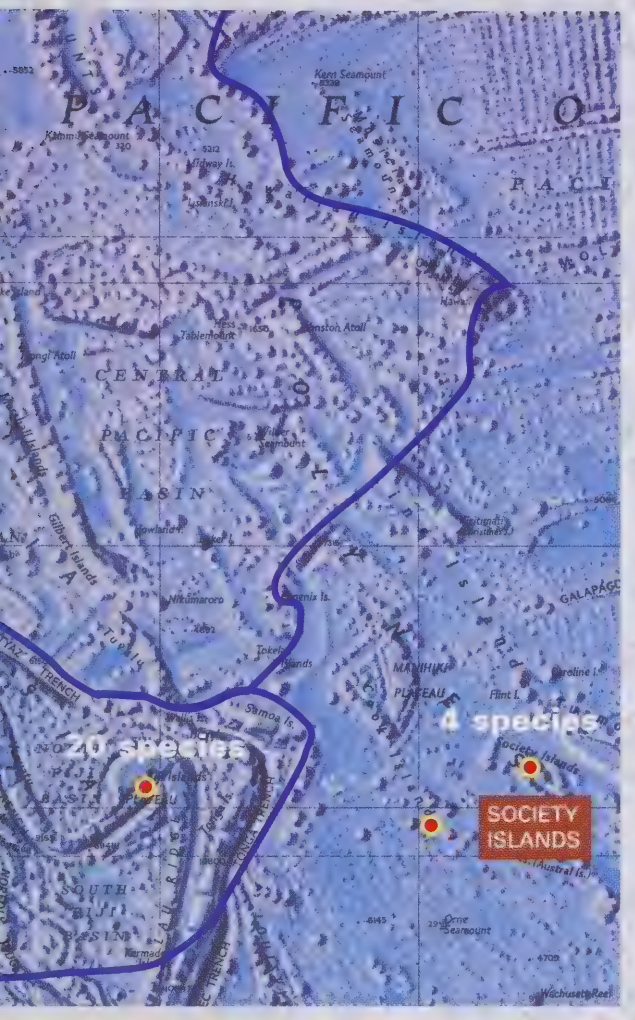


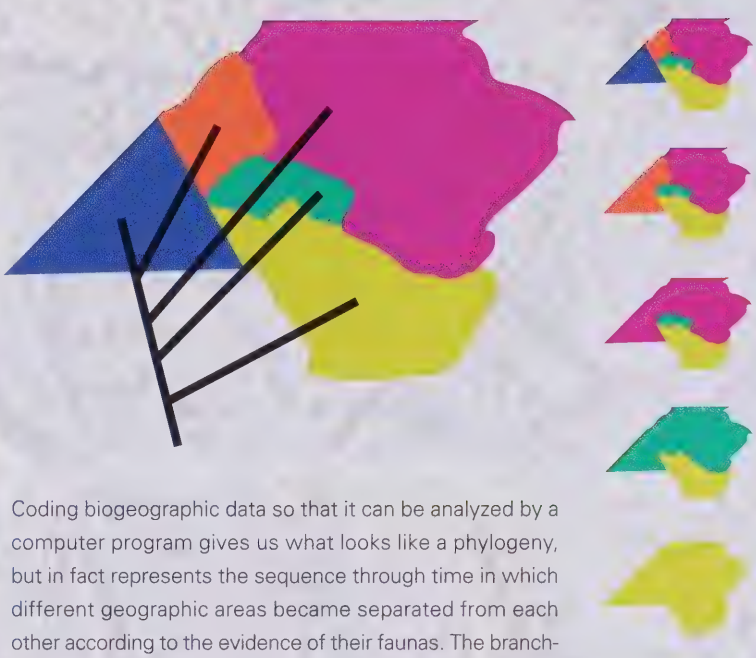
coincident geological and biogeographic histories. My own work, coupled with the publications of others, provided numerous examples to consult.

In a tortuous and complex process that limited space does not allow me to explain here, we code all that data so that it can be analyzed by a computer program. This gives us what looks like a phylogeny, but in fact represents the sequence through time in which different geographic areas became separated from each other according to the evidence of their faunas. I have outlined five of the areas—the Indonesian Triangle, the Philippine sea plate, the central Pacific, the Caroline sea plate, and the Coral Sea. The branching diagram in black shows that the first split, and therefore the oldest, occurred between the Coral Sea area and a region encompassing all the rest of the western and central Pacific. This was followed later by a split between the faunas of the Caroline sea plate and the three remaining areas, and still later in time by a split between the faunas of the Pacific plate and the Philippine plate plus Indonesian Triangle.

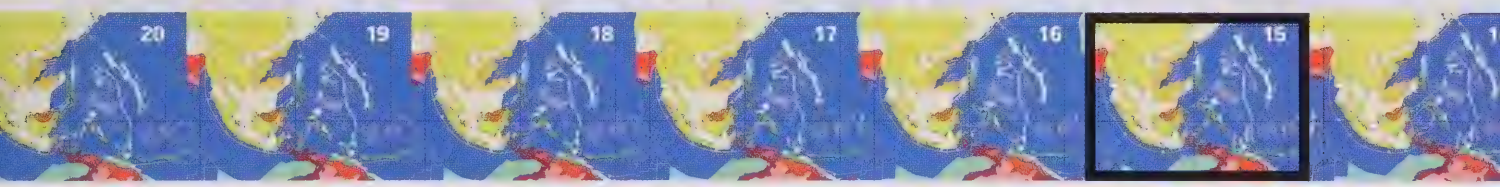
The sequence is important because it shows that the Indonesian Triangle with its marine flora and fauna is one of the two most recent areas to become

l as the result of bio-accumulation of diversity rather than as developed and from which they spread outwards.





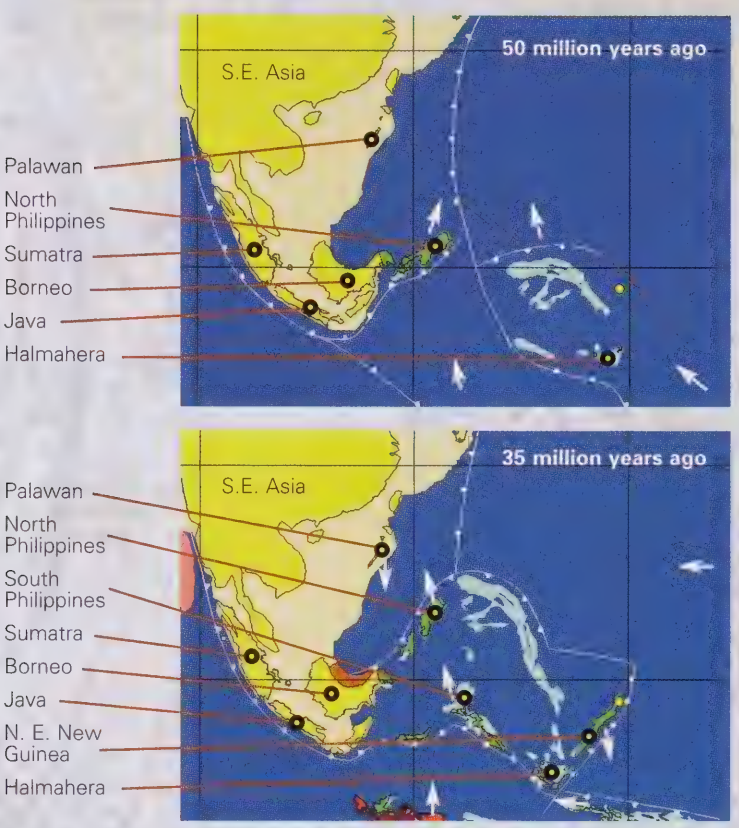
Coding biogeographic data so that it can be analyzed by a computer program gives us what looks like a phylogeny, but in fact represents the sequence through time in which different geographic areas became separated from each other according to the evidence of their faunas. The branching diagram in black shows that the first split, and therefore the oldest, occurred between the Coral Sea area and a region encompassing all the rest of the western and central Pacific. This was followed later by a split between the faunas of the Caroline plate and the three remaining areas, and still later in time by a split between the faunas of the Pacific plate and the Philippine plate plus Indonesian Triangle.



consolidated as a result of shifting sea plates. And this creates a problem for an older paradigm. From my fieldwork in the Philippines it's clear that there are far more species of *Trimma* in this region than anywhere else, and this high level of diversity holds true for most other groups of marine organisms. The old paradigm of historical biogeography says that this must be where they originated—the centre of origin for each of the groups. By extension, the reason for there being fewer and fewer species in these groups the farther away they are from the centre of origin is that some are better travellers or dispersers than others. Good dispersers spread far from the centre of origin, while others could not get very far.

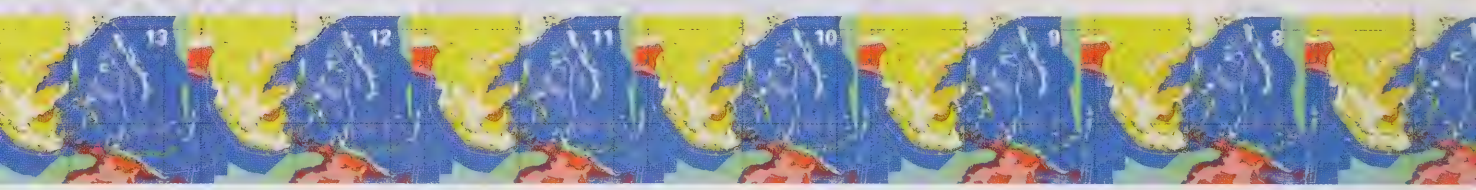
If this area really is a centre of origin, however, it should have been one of the first areas to diverge, not one of the last, or most recent, because it had to supply all the other areas with its own newly evolved species. The Coral Sea, for example, had already formed its fauna well before there ever was an Indonesian Triangle. If the Indonesian Triangle did not yet exist, how could it have been the source of the fauna for the Coral Sea (and other areas)? So this older paradigm surely cannot hold true in this sce-

HOW SEA PLATES MOVED OVER



The conclusions published by Professor Robert Hall of the University of London on the geological history of the Southeast Asian region have important implications for the present-day distributions of plants and animals. If we centre our attention on the area surrounding the Indonesian and Philippine archipelagos, the so-called Indonesian Triangle, we can see that there has been a tremendous amount of movement of plates and islands over the last 50 million years. The figures show the movements of a few selected areas, with white arrows showing the direction of movement. For example, the island of Palawan (today the western-most part of the Philippines) is derived from the Asian (or more properly Eurasian) plate. About 50 million years ago, it existed as an outlier on the southeastern margin of that plate, and the northern part of the Philippines had formed off the eastern tip of Borneo (at this point there were no southern Philippines). The northern Philippines began to move in a northeasterly direction, while Palawan stayed where it was. About 45 million years ago, the southern Philippines formed to the southeast of Borneo, and at 30 million years ago the sea floor began to spread just to the north of Palawan. This spreading eventually formed the South China Sea, pushing Palawan almost directly southwards, while the northern Philippines continued on a northeasterly course. At 25 million years ago, the southern Philippines, which had remained almost stationary during the preceding 20 million years, began to move north, with Palawan and the northern Philippines continu-

PLATE TECTONICS IMAGES COURTESY SE ASIA RESEARCH GROUP RHUL



nario. What, then, if anything, is the explanation?

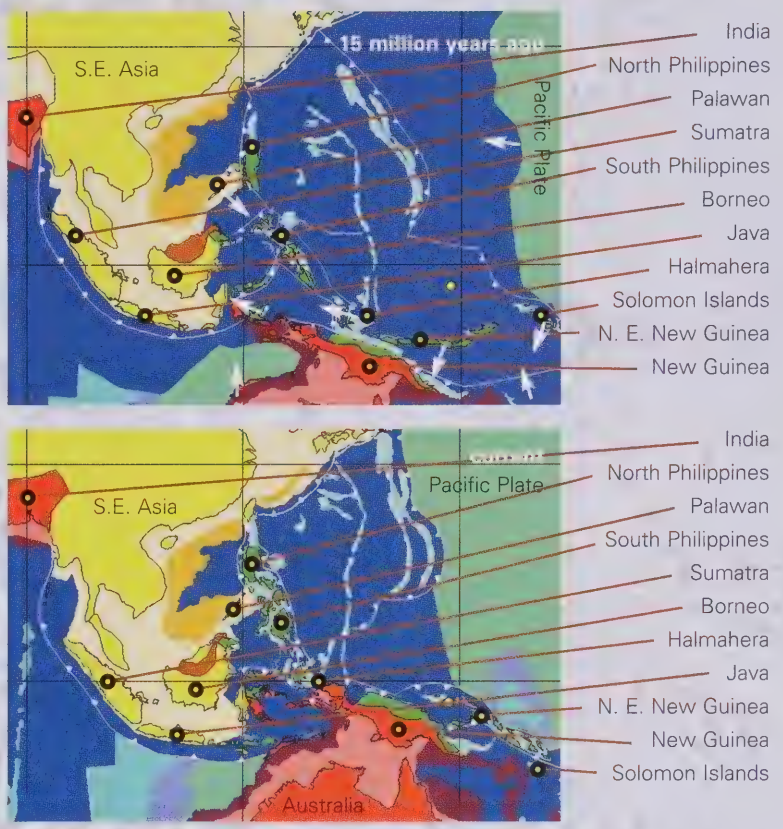
We know that the geological history of the Indonesian region is one of the most complex on Earth, and perhaps a slight understanding of it might hold the key. In this region there has been a tremendous amount of movement of plates and islands over the last 50 million years. The Philippines, for example, formed from the coalescence of several different pieces of land—volcanic islands, bits of continents, islands formed by scrapings that rose from the sea floor as the edge of one plate slid beneath the other, etc. (see sidebar, this page).

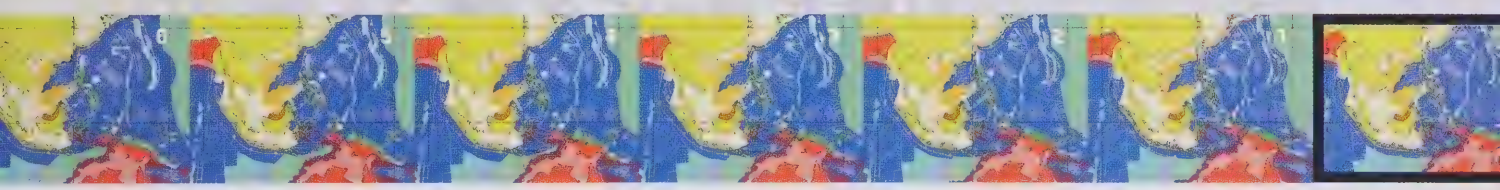
Based on the geological history and the relationships of the areas, I would suggest that the Indonesian Triangle has such a plentiful and diverse fauna precisely because all those bits and pieces of land brought with them the faunas and floras—both marine and terrestrial—that were associated with them, and that at least some of these species were new to the animal and plant life of the Indonesian area, and survived there. Such movement of species is known as passive migration. The richness of this area is much more logically explained as the result of bio-accumulation of diversity rather than as a

THE PAST 50 MILLION YEARS

ing on their previous trajectories. By 15 million years ago, Palawan was directly east of the northern Philippines while the southern Philippines—a long, almost north-south chain of islands—was still trailing after the northern islands. By 10 million years ago, the northern islands of this chain had virtually reached the southern region of the northern Philippines, and over the next several million years the "tail" of the chain played catch-up, as the distances between its component islands narrowed. The whole of the Philippines continued to move, but more slowly and in a north-northwest direction, to form the present-day configuration. Today, of course, the whole region remains active. New Guinea and Sulawesi, too, have complex geological origins involving the coalescence of disparate bits and pieces, each exhibiting considerable movement. On the other hand, the island of Halmahera off the northern tip of New Guinea, has hardly moved at all since the first part of it rose above the sea more than 55 million years ago.

The accompanying figures are used courtesy of Professor Robert Hall of the University of London, whose brilliant geological studies of the Philippine region provided the impetus for the sidebar portion of this article. The frames on this page and running througout the story are excerpted from an animation sequence showing how tectonic plates moved across the earth over the past 55 million years. The National Geographic map on pages 28 – 29 shows the ocean floor as it is today.





centre where most of the new forms developed.

I would suggest that this kind of model, at least for this vast region, replaces the biogeographic paradigm of centres of origin as a general explanation for the region's incredibly diverse fauna and flora. But much further testing of the model in other regions of the world, as well as in the Indonesian Triangle, is needed before we can consider it a general rule. Indeed, it seems probable to me that historical biogeography the world over is a hodge-podge of bioaccumulation, centres of origin, and dispersal—not to mention extinction—that may well defy any single general explanation at this level of analysis.

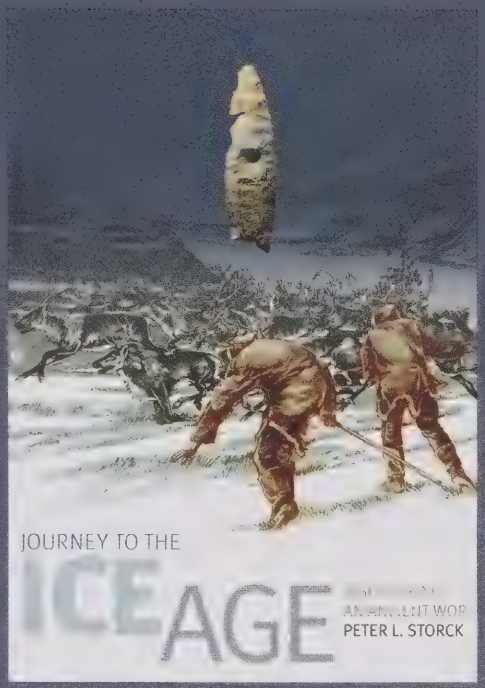
Where do we go from here? I think that we need further exploration into what new insights these paradigm changes may supply, especially in the light of conservation biology. If, for example, the Indonesian Triangle is not the great manufacturing centre of new species, should we still make enormous efforts to conserve it? I believe the answer is yes, because it represents a striking example of how enormously rich biotas may come into existence, and that alone reinforces the region's value to our understanding of nature and hence of ourselves. ■

Journey to the Ice Age

Excerpt from a memoir **by Peter L. Storck**

BRIAN BOYLE, SOM

Searching for traces of the first people
who inhabited what is now southern Ontario.



In *Journey to the Ice Age: Discovering an Ancient World* (2004), ROM senior curator emeritus Peter L. Storck eloquently recounts his efforts to discover the world of Ontario's ice age hunter-gatherers. He was looking for evidence that these people tracked herds of caribou along the shores of glacial Lake Algonquin more than 11,000 years ago. Focusing on his search for stone artifacts and other traces of the Paleo-Indians of what is now southern Ontario, Storck describes the assiduous methods of scientific investigation used to uncover this hidden world.

This excerpt from Storck's memoirs points to the benefits arising from the ROM's dual mandate. As a museum of both natural history and art and archaeology, the ROM affords opportunities for curators from these distinct areas of study to work together synergistically. Storck had been unable to divine the quarry source of the chert used for ice age stone tools until he collaborated with a ROM colleague, Peter von Bitter, a geologist and paleobiologist. Locating the chert source required the specialized knowledge of a geologist. As Storck later concluded, "It would have been surprising if anyone other than a geologist had been able to find the chert." Through their complementary perspectives, archaeologist and geologist solved a mystery and illuminated a corner of an ancient world.

JACKET DESIGN BY GEORGE VAITKUNAS; ARTWORK BY IVAN KOCSIS

When I first started work at the Fisher site I had visions of caribou in my head. These noble animals, I thought, followed the twists and turns of the Algonquin shoreline to the vicinity of Fisher, where they were found or intercepted by Early Paleo-Indians. Several millennia later, in a different geological age, I too tracked the vanished caribou along that same shoreline and found the Paleo-Indians. Thus I was prepared to see the physical attractions of Fisher in terms of caribou hunting.

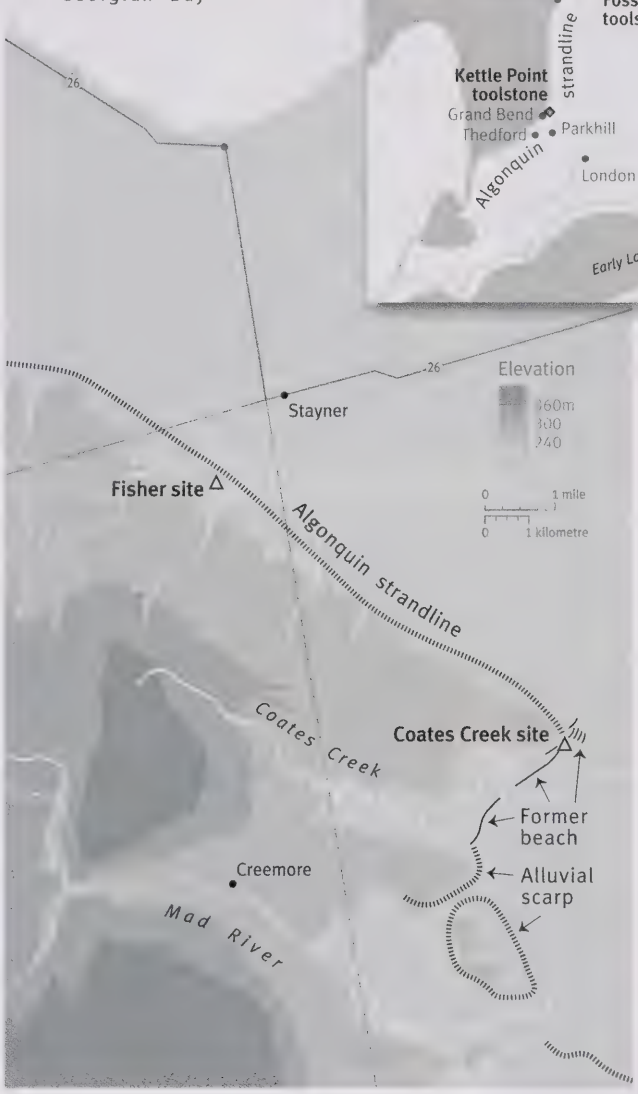
With such a commanding view of the surrounding countryside, it was also easy to believe that the site had been chosen for the advantages it offered as a game lookout, to both north and south along the shoreline and west into the interior countryside. In a spruce-parkland environment Fisher might have offered much the same visibility of the surrounding countryside as it does today, overlooking a rural landscape of grain fields, orchards, and woodlots. I was so attracted by this thought that I set up a mapping table on top of the site, taped a contour map and aerial photograph to its upper surface, and scanned the surrounding countryside with a pair of binoculars through 360 degrees, marking off the areas that could be easily seen from that vantage point and those that could not. I was looking for some pattern that would tell me the directions that Paleo-Indians might have been most interested in and their distances from the site.

I discovered ambiguity. The site provided excellent views in all directions. No single sight corridor stood out.

If, however, the Paleo-Indians were more interested in not being seen, presumably by moving animals, then the view from the north was most important since there were more terrain-blocked views in that direction. This strategy might conceivably have been important if Paleo-Indians were camped at Fisher in anticipation of caribou movements through the site area from the north. That Fisher would have been downwind from those moving animals might also have been an important consideration.

As interesting and logical as this might be, it was also speculative and therefore vaguely unsatisfying. At the time I excavated Fisher there was no evidence from anywhere in Ontario, or the Great Lakes region generally, that Early Paleo-Indians actually hunted caribou. And without preserved animal bone we couldn't base our interpretations on anything other than site location and presumed hunting strategies. So my painstaking work with the binoculars proved little except to my crew. Sweating at the end of long-handled shovels in the hot dust of a cornfield while I stood majestically silhouetted against the skyline, scanning the distant hills under the shade of a beach umbrella, they probably thought I looked more than a little eccentric.

While looking for ghostly herds of caribou on that hilltop I was also newly aware that Fisher may have been attractive to Paleo-Indians not only for the organic necessities of life but also for the inorganic. Just prior to the last season of excavation at Fisher, my geological colleague and good friend



SIMULATION BY DAN LONG / MAP BY ERIC LEINBERGER / EXCAVATION PHOTOS BY AUTHOR.

Map: location of glacial Lake Algonquin, the Fisher archaeological site and the source region of Fossil Hill toolstone in south-central Ontario. Upper left: Work at the Thomson site in the Kolapore uplands, searching for evidence of prehistoric mining for toolstone. Lower right: Work at Fisher, location of several Early Paleo-Indian campsites. Artifacts: (middle left) simulated Early Paleo-Indian spear point in bone foreshaft (note coil of sinew for tying point to shaft); others (all authentic) include (left, from top) hide-working tool and spokeshave for smoothing shafts and (right, from top) spear point, compass graver (possibly for cutting bone buttons), and tool used for cutting slots/sockets.

Top: Author trying to determine which directions may have been most important lines of sight for Early Paleo-Indians in monitoring animal movements from the top of the Fisher site. Middle and lower photos: the "unknown" toolstone, finally discovered in place (*in situ*) and identified as part of the Fossil Hill Formation, a bedrock unit near the top of the Niagara Escarpment in the southern Georgian Bay region.

at the ROM, Peter von Bitter, finally succeeded in tracking down the identity of the unknown white toolstone—the material that Paleo-Indians at Fisher, Parkhill, and numerous other sites in southern Ontario used almost exclusively for their tools. On 7 November 1979, Peter von Bitter, alone and wet in the cold of early winter, chipped a piece of that white stone off living rock. With the swing of a hammer he answered a question that had been worrying me for four years. Of equal or perhaps even greater importance, he opened up an entirely new way of looking for Early Paleo-Indian sites. I would no longer depend on fossil beaches as my only way of investigating the lifeway of Paleo-Indians. And because I could now track them off the beaches, I would be able to see how they used a totally different part of the landscape. Truly, no hammer ever struck with greater effect.

Peter had suspected that the white toolstone came from a bedrock formation in the southern Georgian Bay region. Ploughed fields on the top of the Niagara Escarpment southwest of the city of Collingwood were littered with angular blocks of it, suggesting that the material had been plucked from the earth as glacial ice flowed up the escarpment from the north. When the ice stalled and started to melt back on the upper surface of the escarpment, the blocks of chert were deposited, along with tons of sand and gravel, in the recessional moraines, ribbons of interconnected hills, and deep depressions (called kettles) that mark temporary halts of the retreating ice. With the knowledge that the material had been transported by glacial ice it seemed a simple matter to walk upstream against the flow of the glacier to the bedrock source of the white chert somewhere to the north.

Peter had an advantage over archaeologists who had tried this approach as he was better prepared to use the geological literature for a systematic search in the field. He was also better able to decipher the scattered exposures of bedrock that geologists use to interpret regional stratigraphy.

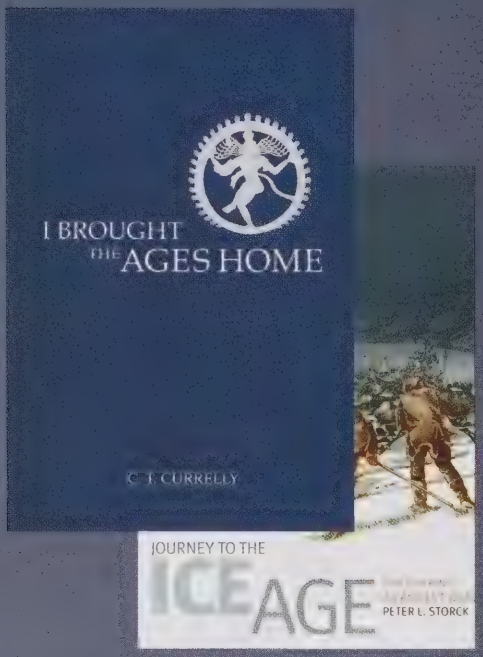
Peter called on the help of one of his colleagues who had mapped the Niagara Escarpment along its entire length in southern Ontario, the late Bruce Liberty, then at Brock University in the Niagara Peninsula. Peter and Bruce Liberty did what all bedrock geologists do. They searched out and stopped at endless roadside exposures of bedrock. While people drove hurriedly by, wondering what could be so interesting in a roadside ditch, the two geologists, together yet wandering separately about, looked intently at the rock through small magnifying glasses. Occasionally they would break off pieces with their hammers to look at fresh surfaces and squirt them with a mild acid to see if they fizzed, a simple way to differentiate limestone from dolostone, a magnesium-rich rock. They also visited bedrock quarries, river cuts, and scenic waterfalls.

Nothing! The missing chert—and its host rock formation—stayed missing. At this point Peter thought the chert might very well be from a "ghost" deposit: that word I have used before with respect to people at the Banting site and, more recently, animals at Fisher. Peter's ghost was the remains of a bedrock formation that had long since eroded away, leaving

BRIAN BOYLE, ROM

PHOTOGRAPHY BY BILL ROBERTSON / DRAWINGS BY JOHN PEMBERTON

Top: Fragments of Fossil Hill toolstone (a silica-rich material called chert, very similar to flint). Middle: A colonial coral that lived in subtropical seas that covered southern Ontario 410 million years ago (this coral, found only in the Fossil Hill Formation, was an important clue to the identity of the unknown toolstone). Bottom: Early Paleo-Indian preform (left) and spear points from the Fisher site. Hand drawings (right) illustrate how toolstone may have been worked (second and third from top), tools used in scraping and cutting hides (top and second from bottom, respectively), and smoothing wooden shafts (bottom).



ROM SENIOR CURATOR EMERITUS Peter L. Storck's 2004 publication of *Journey to the Ice Age: Discovering an Ancient World* marks only the second time in the Museum's history that a ROM curator has published his memoirs. In 1956, Charles T. Currelly, the first director of the Royal Ontario Museum of Archaeology, released *I Brought the Ages Home*, chronicling his adventures in Egypt and other parts of the world far from Ontario and the institution he was instrumental in founding. Currelly's memoirs have just been reissued by the ROM in a fine edition to commemorate the 90th anniversary of the opening of the Museum.

Above: Book case-cover for the new release of Charles T. Currelly's *I Brought the Ages Home* partially overlying cover of Peter L. Storck's *Journey to the Ice Age*. Right: Mannequin in former Ontario Prehistory Gallery, representing an Early Paleo-Indian hunter tying a spear point to a wooden foreshaft.

only the more resistant chert. Peter suspected the ghost was the so-called Guelph Formation, which is present today only as small remnants on the uppermost part of the Niagara Escarpment. But the Guelph Formation held its secrets beneath a mantle of glacial deposits and was not that forthcoming.

The impasse was broken by a piece of fossil coral that had grown in a tropical reef in a warm sea more than 410 million years ago. Peter picked up this fragment of the middle Paleozoic era—a time much older than the Mesozoic, the age of dinosaurs—from a field that was almost covered with chert fragments and that had been shown to him by Bill Fox, then an archaeologist with the Ontario government. The coral was a well-known fossil in the Silurian-age Fossil Hill Formation. This bedrock unit underlies the caprock of the Niagara Escarpment, the Amabel Formation, which is in turn below the remnants of the higher, and therefore younger, Guelph Formation. Peter immediately wondered if the chert was associated with the coral and therefore came from the Fossil Hill rather than the Guelph Formation.

After returning to Toronto with this piece of fossil coral, Peter contacted another of his colleagues, Peter Telford, who worked with the Ontario Geological Survey and had mapped the region. Obtaining a copy of Telford's most recent map, Peter von Bitter returned to the field a week or so later and started systematically checking bedrock exposures of the Fossil Hill Formation, regardless of where and how big they were. I helped occasionally and realized then that geologists did more than drive comfortably from one roadside exposure to another like bees from flower to flower. They also clawed through dense bush, crossed wide open fields sometimes filled with danger such as a solitary bull in a distant corner, and descended into stream cuts so deep and overgrown that the sun barely penetrated. Peter did this and more with a doggedness and single-minded intensity that was often no less interesting and amazing to me than what we were jointly seeking.

It was on one of those cross-country walks, from which I apologetically excused myself because of other pressing business, secretly with few regrets, that Peter made his discovery. Actually three discoveries. After the first one, the other two happened fast, one upon the other: three bedrock outcrops of the Fossil Hill Formation that contained white chert, in place. Or, as Peter would say, *in situ*.

Looking back, it's easy to understand why the chert stayed missing so long. The fossil coral was the key and it would probably have been recognized as such only by a geologist. The coral led to a layer of bedrock that, because it was relatively thin, was sometimes mapped by geologists and sometimes not. In the latter case it was simply included with the overlying Amabel Formation, but if it was mapped, the chert, which seldom interests geologists, was either noted only briefly or not at all. It was thus well hidden, accessible only through the fossil coral as an obscure key to unlock the door to the hidden room beyond and an understanding of the vagaries of geological mapping to pass through that door. It would have been surprising if anyone other than a geologist had been able to find the chert. ■

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THE MAGAZINE OF THE ROYAL ONTARIO MUSEUM

Astolat to Astoria

FEATURE REVIEWS

Victorian Painting

By Lionel Lambourne
(Phaidon, Paper: $69.95)

A KALEIDOSCOPIC PANORAMA of Victorian painting, Lambourne's work includes not only the predictable exponents of the topic, but very worthy lesser-known contemporaries as well, including painters from countries with British colonial ties. The sea is a constant in the English paintings, often with mythological subtext. Edward Poynter's *Cave of the Storm Nymphs* lyrically depicts three sea goddess-sirens basking on the beach at their cavern entrance amidst jewels, embroidered silks, and gold coins—yield of the storm—as a ship is dashed on the nearby rocks. On the other hand, a sea painting commissioned by the Royal Consort, *Neptune Resigning to Britannia the Empire of the Sea,* may be more comic than cosmic. Neptune, astride a brilliant white mer-horse, flanked by two others, throws in the (wet) towel—he knows his betters when he meets them—handing over his gold crown to a winged messenger, who will ferry it to Britannia personified. The old sea god's attendants trumpet his capitulation as a supporting cast of mermaids offers booty—gifts of pearls. At Britannia's side, on the English shore, the royal lion eyes the drollery suspiciously.

A prominent place is given to female artists. Sophie Anderson's *Elaine, or The Lily Maid of Astolat,* illustrates one of Tennyson's *Idylls of the King,* relating the sad story of the lily maid who died for love and whose body was borne by barge to many-towered Camelot. The river setting anticipates Waterhouse's 1888 *Lady of Shalott*. The heroine adorns a watercraft bearing both Christian and ancient pagan symbols. Her skin and her lilies are rendered as white porcelain or marble. Her cascading mane and her floral-embroidered robe, love birds at its centre, glow golden.

Tiffany Flora and Fauna

By John Loring
(Abrams, Cloth: $75)

THIS EXQUISITE two-volume slip-cased set, practically an *objet d'art* in itself, showcases Tiffany's "stunningly bejewelled plant and animal kingdom." Recounting both the history of Tiffany's and the natural history context of the artifacts, Loring, the design director of Tiffany and Company since 1979, offers an in-depth tour of a glittering gallery. It is as if we are there with him in the Tiffany archives as he takes us behind the scenes, into the vaults, lovingly and authoritatively explaining the connectivity of the natural world and the artifacts. One of the classic flora-related pieces featured is the Louis Comfort Tiffany *Wisteria* lampshade, inspired by a house at Chestnut Hill, outside Boston, surrounded by wisteria vines. Tiffany floral-patterned lamps have historically decorated such east-coast institutions as New York City's Waldorf-Astoria Hotel.

Sumptuous items of personal adornment include the extravagant *Vigne* necklace of amethyst grapes, cabochon emeralds, and diamond-pavé leaves, with 18-carat gold vines, designed by Jean Schlumberger. Sensational gifts of love include the *dauphin* diamond clip with an emerald mouth and sapphire eyes, occasionally called the iguana clip after Welsh actor Richard Burton presented one to Elizabeth Taylor to celebrate their reunion when he completed filming *The Night of the Iguana* in 1964. Also in this category is the plumes necklace, "a stylized rendition of feathers composed of diamonds, sapphires and rubies," designed by Schlumberger for the fab/glam beauty Fiona von Thyssen-Bornemisza, third wife of billionaire art collector Baron Hans Heinrich von Thyssen-Bornemisza.

SELECTED AND REVIEWED BY GLEN ELLIS

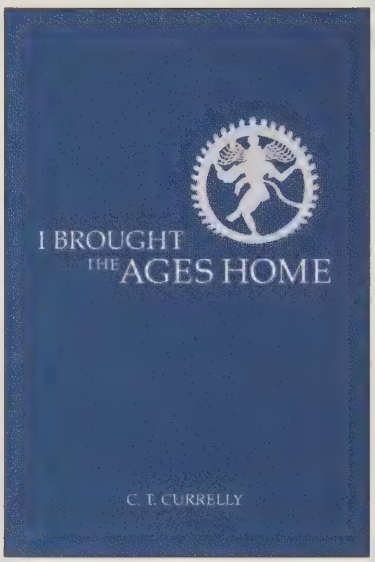
The following excerpt is from the foreword to I Brought the Ages Home, *by Charles T. Currelly, the first director of the Royal Ontario Museum of Archaeology. The book is now available in a fine edition (ROM, 2004) to commemorate the 90th anniversary of the opening of the Museum.*

AS A CHILD, Currelly visited what could have been called Toronto's "Museum in the Tower," a sampling of artifacts and specimens housed in the central tower, and west hall, of the University of Toronto's University College. The exhibits impressed the schoolboy and he lingered to study them. Born in the western Ontario village of Exeter, on January 11, 1876, he also showed a keen interest in the work of village artisans—the blacksmith, the wheelwright, the tanner—eager to understand what things were made of, and how they were made.

In 1894, he entered Toronto's Victoria University, graduating in 1898 to serve as a Methodist missionary in Dauphin, Manitoba. With a district of 750 square miles within his jurisdiction, he travelled by horseback through "high willow and poplar scrub," often at subarctic temperatures or during mosquito infestations, always with a keen eye for local detail and colour, observing and recounting everything from the beadwork techniques of the Saulteaux to ancient Galician house-building methods transplanted from the Carpathian Mountains.

By 1900, he was back in Toronto to do postgraduate work in theology. A serendipitous trip to the British Museum led to his being invited to work with the famed Egyptian archaeologist Sir Flinders Petrie and in turn to join the staff of the Egypt Exploration Fund. A second auspicious event solidified his future. University of Toronto Chancellor Nathanael Burwash, on learning of the fledgling archaeologist's appointment, remarked: "This is our chance to start a museum in the university."

Currelly's course over the next years was remarkable, not only in terms of the wealth of artifacts and



specimens he would acquire, but also in terms of his adventures—across oceans, deserts, and mountains, through villages and cities. His story is on an epic scale, replete with panoramic vistas and a cast of thousands. He encounters the superstitions and lore of local peoples—the terror of vampires, the dangers of sleeping near bewitched springs, even fear among villagers that he may be the prophesied enchanter. In his mingling he must accommodate local custom to accept with, if not delight, at least not with revulsion, the delicacy of a freshly plucked sheep's eye rolled in fat. Sometimes he is simply bewildered. When he advises an American clergyman's wife that her scarab is a forgery, she replies: "Oh, no. I bought it from my donkey boy, who said he stole it from your excavation, and he has such an honest face that I am sure he could not have been lying."

In his accounts of fieldwork, the past sometimes rushes into the present unexpectedly, even horrifically. In Egypt, a worker finds a mummified hand, which upon removal of the wraps reveals "seven gold and jewelled bracelets on the wrist, the earliest worked jewellery that has been found in Egypt. It was the hand of the Queen of Zer." By contrast, the exquisite girl queen, Henhenet, is unveiled perfectly preserved, her beauty unspoiled, transcendent across time.

As the first director of the Royal Ontario Museum of Archaeology, Dr. Currelly worked tirelessly to build both the international and Canadian collections. His association with art dealer George Crofts and Bishop William White led to the ROM's celebrated Chinese collections. His friendship with pioneering Canadian ethnologist and folklorist Marius Barbeau resulted in the iconic Haida and Nisga'a crest poles, a superb collection of Northwest Coast native art, and the foundations of the ROM's collection of early French-Canadian furniture—the most significant outside Quebec. In a museum career that spanned half a century, he oversaw the opening of the original yellow-brick ROM of 1914, running north to south alongside Philosophers' Walk and the Great Stone Longhouse of 1933, on Queen's Park, retiring in 1946 at age 70. Through it all, his respect for antiquities was reverential: "Seeing and touching these marvels of the past was so great that I had a feeling one ought to fast, or to make some peculiar preparation before handling such priceless objects."

—Glen Ellis
Head of Publications
Royal Ontario Museum

Bone Identity

It's the upper canines—so big that the premolar teeth are beside rather than behind them—that reveal the identity of the animal to which this skull fragment once belonged.

June Langille's fossil find.

KEVIN SEYMOUR

Dear ROM:

I WOULD LIKE TO FIND OUT if this specimen is a dinosaur tooth. My husband worked as a fisherman on a scallop dragger and this bone was raked up off the Georges Bank.

We've had this bone for approximately 30 years now and would very much like to know to what species of animal it belonged and how old it might be. Thank you for your time.

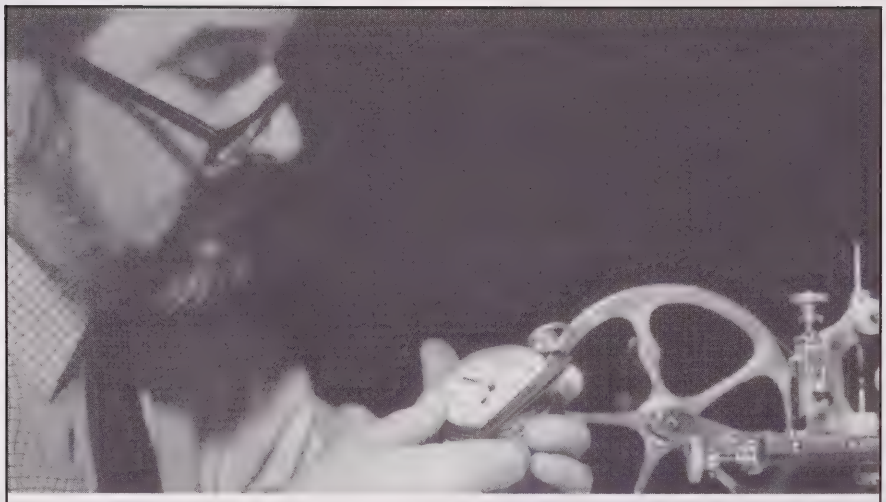
JUNE LANGILLE,
NOVA SCOTIA

Dear June,

YOUR VERY INTERESTING SPECIMEN came from a walrus skull, specifically, the left maxilla, or left upper jaw. The long, slightly curved portion is the upper tusk, or upper canine tooth. Judging by the size and breadth of this tusk, I suspect that your specimen came from a male walrus. The tusks of female walruses are more slender, rounder in cross-section, and slightly more curved in the middle.

Human teeth are typical of mammal teeth in that they all appear in one row, so that the canine tooth is in front of the premolars, and the premolars are in front of the molars. In the walrus, however, the upper canine is so huge and out of proportion to the rest of the teeth that the premolar teeth are actually beside the canine, not behind it. This one feature alone identifies your specimen as a walrus.

At the base of the tusk you can see the sockets (alveoli) for the other upper teeth. On your specimen, there are three larger holes at the front (with tooth #3 still present), and evidence of two smaller teeth behind (with a tiny tooth #5 still present). Although the number and placement of teeth are quite variable in walrus, generally there are no upper molars, only premolars. The first tooth is actually a modified incisor, and the next four are premolars. The last premolar is often tiny, and in this respect your specimen is typical.



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COMING IN THE WINTER 2004/5 ISSUE

ROTUNDA

Inside Indigo

ROM art historian Ka Bo Tsang examines why and how the Chinese—ingeniously and resourcefully—made use of indigo dye to embellish their clothing and household items.

There is only one species of walrus recognized today in the world, *Odobenus rosmarus*. It has a circumpolar distribution, ranging from the central and northeastern coast of Siberia and the northwestern coast of Alaska, through the Canadian Arctic islands to both northern coasts of Greenland. Walruses had a broader distribution in the distant past. Fossil remains of extinct relatives are known from Russia and Europe, particularly England, as well as from coastal parts of eastern North America, as far south as Florida.

Walruses are somewhat migratory, riding ice floes south in the winter, and moving north again when the ice retreats. A walrus from the Georges Bank is a little out of range for walrus today, although it might represent an individual that came farther south than usual on an ice floe. Alternatively, your specimen might be older than present-day. In historical times, the walrus ranged farther south; the southern-most breeding colony was known from Sable Island, off Nova Scotia. This colony was exterminated by hunters by about 1650. Or your specimen might be even older, perhaps being postglacial in age (some thousands of years old, maybe even 8000 to 9000 years old), and in defense of this idea, your specimen does look to be somewhat mineralized. There would be no way of telling the exact age of your specimen without doing a carbon date, however. Other walrus remains have been dredged off the ocean bottom in half a dozen places more southerly than Newfoundland, including the Gulf of Maine, off Portsmouth, New Hampshire, and along the St. Lawrence Seaway. I even located another record in the literature from Georges Bank, recovered by a trawler in 1928.

Thank you for bringing this most interesting specimen to our attention. It represents one of only a handful of southern walrus specimens recovered to date.

Kevin Seymour is assistant curator of Palaeobiology, ROM Natural History.

Canine Character

Questions and answers about a Russian animalier sculpture

A. W.'s cast metal sculpture of a dog

Dear ROM Answers,

I HAVE A DOG that I fell in love with over 25 years ago at my great aunt's flat in England. It came into my Dad's possession after his aunt passed away and he's since passed it to me. From what I remember, the dog was of Russian origin and was one of a limited number of castings. (How many I have no idea.)

The dog is of a silver cast metal, hollow, painted black, 6 7/8 inches [16.7 cm] tall, 14½ inches [36.8 cm] long from toe to tail and about 7 inches [17.78 cm] wide at the back foot. There are letters on his collar, numbers on his underside, KAC3.1908, and some more letters on the inside of the leg that I can't make out (very tiny).

Is there anything else you can tell me about this dignified-looking dog, and if you think he is valuable should I have him properly appraised?

A. W.
OAKVILLE, ONTARIO

COREY KEEBLE

Dear Reader,

WE WERE PLEASED to receive your letter with the photographs of the canine sculpture in your possession. The cyrillic signature on the collar identifies the sculptor as N. Lieberich, specifically, Nicolai Ivanovich Leberich, Liberich, or Lieberich (Russian; 1828–1883). Lieberich studied at the St. Petersburg Academy in pre-revolutionary Russia, and is best known for his animalier sculptures in silver and bronze. He was a military officer prior to becoming a sculptor. At the St. Petersburg Academy, he was a pupil of

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Ceramic plate and trivet from a blue-and-white Persian plate with verses from Omar Khayyam, Persia, 1673 A.D.;
Sterling silver Sphinx Hummingbird Moth pin,
from a specimen in the ROM's collections.

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BRIAN BOYLE, ROM / 976.196.1

The ROM's collection of animalier bronzes includes this late-19th-century Bronze Bull after the sculptor Milet

Baron Clodt. His best-known animal figures were sculptures of horses, but his repertoire included other animal figures as well. A Russian parallel to the French animalier sculptors of the 1800s, Lieberich enjoyed fame both in Russia and abroad. His models were widely circulated and were reproduced in quantity. Signatures on silver or bronze statuettes relate to the original models in wax or clay. The casting in your possession therefore is more correctly referred to as "after" rather than "by" the sculptor. The sculpture is probably no earlier than 1908, assuming the number on the underside is in fact a date.

Sculptures depicting animals were popular in the Graeco-Roman world, and influenced the development of bronze statuettes of animals and birds at the time of the Renaissance, notably in Florence in the bronze statuettes of Giovanni Bologna (1529–1608) and his associates, followers, and imitators. In France, a great revival of this art took place during the 19th century. Among the best known of the so-called animaliers were Antoine Louis Barye (1796–1875), Emmanuel Frémiet (1824–1910), and Pierre Jules Mêne (1810–1871), but there were many others specializing in this particular art form in many parts of Europe as well as in France. The ROM's collection of animalier bronzes includes a late-19th-century Bronze Bull after a sculptor who signed his works "Milet," and a bronze maquette for a lion group for the Pont Alexandre III of c.1907 taken from a wax original by Aimé Jules Dalou (1838–1902). It is one of a limited edition of casts made by the French bronze founder A. Hébrard.

Your statuette clearly derives from a model by a skilled sculptor with remarkable powers as a master of anatomically correct animal form. The casting has considerable charm and presence, and a strong sense of truth to living prototype. It is no wonder that it earned well-deserved appreciation from you as its present owner. Congratulations!

K. Corey Keeble is a curator, specializing in European sculpture as well as other fields, in ROM World Cultures.

WE'D LIKE TO HEAR FROM YOU

If you own furniture, silver, glass, metalwork, ceramics, textiles, or small decorative objects that may have an interesting past and have aroused your curiosity, this column is for you. Send a clear colour photograph (or 35-mm colour slide) of the object against a simple background, providing dimensions, a description, any markings, or any known details of its history to: ROM Answers, c/o *Rotunda* magazine, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6. Be sure to enclose a stamped, self-addressed envelope large enough to include any photos that must be returned to you.

Neither *Rotunda* nor the author nor any other person who may be consulted assumes any legal responsibility for these opinions or their ramifications. No financial appraisals will be offered.

Letters will be acknowledged as staff time permits.

A Case for History

Gathering arrays of curiosities

ROM ARCHIVES

Cabinets of curiosities were first assembled by princes of state and church beginning in the Middle Ages. The cabinet seen here is in the spirit of the 18th century, when ethnographic items, natural history specimens, and historical works of art were typical of such collections. This display was created for the original ROM exhibition *Silk Roads China Ships: an Exhibition of East-West Trade*, which ran from September 1983 to January 1984.

There is a dodo skeleton, a bronze sculpture, and a pair of moccasins, among other items. Many collectors devoted whole rooms in their palaces or country houses to display, and many a museum has its origins in such accumulations.

Even today, many of us have such a "cabinet of curiosities" in our homes.

JULIA MATTHEWS

Julia Matthews is head of the ROM's Library and Archives.

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